DOCUMENT RESUME

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TITLE Military Curricula for Vocational & Technical Education. Carpentry Specialist, 3-15.

INSTITUTION Air Force Training Command, Sheppart AFB, Tex.; Ohio State Univ., Columbus. National Center for Research in Vocational Education.

SPONS AGENCY Bureau of Occupational and Adult Education (DHEW/OE), Washington, D.C.

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DESCRIPTORS Behavioral Objectives; Building Trades; *Cabinetmaking; *Carpenters; Construction (Process); Course Descriptions; Curriculum Guides; Equipment Utilization; Finishing; Hand Tools; High Schools; Learning Activities; Machine Tools; Postsecondary Education; Prefabrication; Study Guides; *Trade and Industrial Education; *Woodworking; Workbooks

IDENTIFIERS Military Curriculum Project

ABSTRACT

This plan of instruction, lesson plans, and study guides and workbooks for a secondary-postsecondary-level course in carpentry is one of a number of military-developed curriculum packages selected for adaptation to vocational instruction and curriculum development in a civilian setting. Purpose stated for the 233.5-hour course is to provide basic-level training in carpentry. The following topics are covered: carpenter's hand tools, portable power tools, and shop tools; construction and maintenance of wood structures; installation of building hardware; and erection of prefabricated buildings. The plan of instruction, which suggests number of class instruction, shop, and study hours devoted to each course objective, is based on four blocks of instruction: Introduction to Carpentry (5 units), Cabinet Construction (9 units), Building Construction (6 units), and Building Finishing Work (7 units). Contents of the lesson plans include criterion objectives, equipment needed, outline with presentation and application, evaluation, and assignment. Study guides present the information needed to complete the unit or make assignments in other publications which contain the required information. Workbooks contain work procedures such as missions (exercises), problems, and questions. Although not provided, two textbooks, Modern Carpentry and Modern Woodworking, are required, and five films are recommended. (YLB)

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ED183823

Drafting
Dietetics Diesel
Diesel Repair
Dental Assisting
Data Processing
Curriculum Development
Construction Trades
Carpentry Carpentry
Blueprint Reading
Aviation Mechanics
Auto Mechanics
Welding Welding
Stenography Stenography
Small Equipment Repair
Radiology Radiology
Radio-TV Broadcasting
Printing Printing
Physical Therapy Assisting
Photography Photography
Nursing Nursing Nursing
Metal Patternmaking
Medical Lab Assisting
Machine Shop
& Supervision
Air Conditioning
Food Service
Electronics

Military Curricula for Vocational & Technical Education

CARPENTRY SPECIALIST

3-15

CE 024 382

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THE NATIONAL CENTER
FOR RESEARCH IN VOCATIONAL EDUCATION
THE OHIO STATE UNIVERSITY

This military technical training course has been selected and adapted by The Center for Vocational Education for "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education," a project sponsored by the Bureau of Occupational and Adult Education, U.S. Department of Health, Education, and Welfare.

MILITARY CURRICULUM MATERIALS

The military-developed curriculum materials in this course package were selected by the National Center for Research in Vocational Education Military Curriculum Project for dissemination to the six regional Curriculum Coordination Centers and other instructional materials agencies. The purpose of disseminating these courses was to make curriculum materials developed by the military more accessible to vocational educators in the civilian setting.

The course materials were acquired, evaluated by project staff and practitioners in the field, and prepared for dissemination. Materials which were specific to the military were deleted, copyrighted materials were either omitted or approval for their use was obtained. These course packages contain curriculum resource materials which can be adapted to support vocational instruction and curriculum development.

The National Center Mission Statement

The National Center for Research in Vocational Education's mission is to increase the ability of diverse agencies, institutions, and organizations to solve educational problems relating to individual career planning, preparation, and progression. The National Center fulfills its mission by:

- Generating knowledge through research
- Developing educational programs and products
- Evaluating individual program needs and outcomes
- Installing educational programs and products
- Operating information systems and services
- Conducting leadership development and training programs

FOR FURTHER INFORMATION ABOUT
Military Curriculum Materials
WRITE OR CALL
Program Information Office
The National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road, Columbus, Ohio 43210
Telephone: 614/486-3655 or Toll Free 800/848-4815 within the continental U.S. (except Ohio)

THE NATIONAL CENTER
FOR RESEARCH IN VOCATIONAL EDUCATION
The Ohio State University · 1960 Kenny Road · Columbus, Ohio 43210
Tel (614) 486-3655 Cable CTVOCEDOSU/Columbus, Ohio

Military Curriculum Materials for Vocational and Technical Education

Information and Field Services Division

The National Center for Research in Vocational Education

Military Curriculum Materials Dissemination Is . . .

an activity to increase the accessibility of military-developed curriculum materials to vocational and technical educators.

This project, funded by the U.S. Office of Education, includes the identification and acquisition of curriculum materials in print form from the Coast Guard, Air Force, Army, Marine Corps and Navy.

Access to military curriculum materials is provided through a "Joint Memorandum of Understanding" between the U.S. Office of Education and the Department of Defense.

The acquired materials are reviewed by staff and subject matter specialists, and courses deemed applicable to vocational and technical education are selected for dissemination.

The National Center for Research in Vocational Education is the U.S. Office of Education's designated representative to acquire the materials and conduct the project activities.

Project Staff:

Wesley E. Budke, Ph.D., Director
National Center Clearinghouse

Shirley A. Chase, Ph.D.
Project Director

What Materials Are Available?

One hundred twenty courses on microfiche (thirteen in paper form) and descriptions of each have been provided to the vocational Curriculum Coordination Centers and other instructional materials agencies for dissemination.

Course materials include programmed instruction, curriculum outlines, instructor guides, student workbooks and technical manuals.

The 120 courses represent the following sixteen vocational subject areas:

- Agriculture
- Aviation
- Building & Construction Trades
- Clerical Occupations
- Communications
- Drafting
- Electronics
- Engine Mechanics
- Food Service
- Health
- Heating & Air Conditioning
- Machine Shop
- Management & Supervision
- Meteorology & Navigation
- Photography
- Public Service

The number of courses and the subject areas represented will expand as additional materials with application to vocational and technical education are identified and selected for dissemination.

How Can These Materials Be Obtained?

Contact the Curriculum Coordination Center in your region for information on obtaining materials (e.g., availability and cost). They will respond to your request directly or refer you to an instructional materials agency closer to you.

CURRICULUM COORDINATION CENTERS

EAST CENTRAL
Rebecca S. Douglass
Director
100 North First Street
Springfield, IL 62777
217/782-0759

NORTHWEST
William Daniels
Director
Building 17
Airdustrial Park
Olympia, WA 98504
206/753-0879

MIDWEST
Robert Patton
Director
1515 West Sixth Ave.
Stillwater, OK 74704
405/377-2000

SOUTHEAST
James F. Shill, Ph.D.
Director
Mississippi State University
Drawer DX
Mississippi State, MS 39762
601/325-2510

NORTHEAST
Joseph F. Kelly, Ph.D.
Director
225 West State Street
Trenton, NJ 08625
609/292-6562

WESTERN
Lawrence F. H. Zane, Ph.D.
Director
1776 University Ave.
Honolulu, HI 96822
808/948-7834

CARPENTRY SPECIALIST

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Building Construction - Study Guides and Workbooks Page 511
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CARPENTRY SPECIALIST

Classroom Course

3-15

1

Developed by:

United States Air Force

Development and Review Dates

May 1, 1974

Occupational Area:

Building and Construction

Target Audiences:

Grades 10-adult

Print Pages:

495

Cost:

$10.00

Availability:

Military Curriculum Project, The Center for Vocational Education, 1960 Kenny Rd., Columbus, OH 43210

Contents:	Type of Materials: Lesson Plans:	Type of Materials: Programmed Text:	Type of Materials: Student Workbook:	Type of Materials: Handouts:	Type of Materials: Text Materials:	Type of Materials: Audio-Visuals:	Instructional Design: Performance Objectives:	Instructional Design: Tests:	Instructional Design: Review Exercises:	Instructional Design: Additional Materials Required:	Type of Instruction: Group Instruction:	Type of Instruction: Individualized:
			No. of pages									
Block I—*Introduction to Carpentry*	●		181		●	★	●		●	★	●	
Block II—*Cabinet Construction*	●		25		●	★	●		●	★	●	
Block III—*Building Construction*	●		29		●	★	●		●	★	●	
Block IV—*Building Finish Work*	●		32		●	★	●		●	★	●	

★ Materials are recommended but not provided.

Expires July 1, 1978

Course Description:

This course is designed to provide basic level training in carpentry. Technical training includes an introduction to carpentry; use of carpenter's hand, portable power, and shop tools; construction and maintenance of wood structures; installation of building hardware; and erection of prefabricated buildings. Shop and theory assignments are covered in this course. The first (4) units and the 6th unit of instruction in Block I are not suitable for vocational programs, since they deal with military-specific topics. These units have been deleted. The selected units are listed below:

Block I — *Introduction to Carpentry*

Unit 5 — **Shop Math** (3 hours class instruction)
Unit 7 — **Hand Tools** (4 hours class instruction, 2 hours shop)
Unit 8 — **Building Materials** (6 hours class instruction)
Unit 9 — **Interpreting Drawings** (12 hours class instruction)
Unit 10 — **Project Construction** (16 hours class instruction, 14 hours shop)

Block II — *Cabinet Construction*

Unit 1 — **Selecting and Cutting Material for Cabinet Construction** (6 hours class instruction, 4½ hours shop)
Unit 2 — **Cabinet Framework, Sides and Top** (1 hour class instruction, 5 hours shop)
Unit 3 — **Joints** (3/4 hour class instruction, 5¼ hours shop)
Unit 4 — **Trim Work** (1 hour class instruction, 5 hours shop)
Unit 5 — **Curved Edge Sanding** (1 hour class instruction, 5 hours shop)
Unit 6 — **Surface Sanding and Decorative Shaping** (1 hour class instruction, 5 hours shop)
Unit 7 — **Edge Finishing** (½ hour class instruction, 5½ hours shop)
Unit 9 — **Cabinet Assembly and Finishing** (16 hours shop)

Block III — *Building Construction*

Unit 1 — **Foundations and Form Construction** (2 hours class instruction, 4 hours shop)
Unit 2 — **Tight Frame Construction** (4 hours class instruction, 17 hours shop, 2 hours study)
Unit 3 — **Scaffold Construction** (1 hour class instruction, 5 hours shop, 2 hours study)
Unit 4 — **Roof Construction** (4 hours class instruction, 11 hours shop, 6 hours study)
Unit 5 — **Porches and Stairs** (3 hours class instruction, 3 hours shop, 2 hours study)
Unit 6 — **Sheathing** (1 hour class instruction, 3 hours shop, 2 hours study)

Block IV — *Building Finish Work*

Unit 1 — **Roofing and Siding** (3 hours class instruction, 9 hours shop, 4 hours study)
Unit 2 — **Door and Finish Hardware** (4 hours class instruction, 8 hours shop, 4 hours study)
Unit 3 — **Vents, Louvers, and Window Installation** (1 hour class instruction, 5 hours shop, 2 hours study)
Unit 4 — **Insulation, Interior Walls, Flooring and Prefabricated Units** (4 hours class instruction, 8 hours shop)
Unit 5 — **Prefabricated Building Erection** (2 hours class instruction, 9 hours shop)
Unit 6 — **Heavy Timber Construction** (½ hour class instruction, 3 hours shop)
Unit 7 — **Man-Hour and Material Estimation** (2 hours class instruction)

Materials for use by the instructor include a plan of instruction for each block and lesson plans for each unit of instruction. Student materials include study guides and workbook materials for each block. Study guides present the information needed to complete each unit or make assignments in other publications which contain the required information. Workbooks contain procedures designed to help the student achieve unit learning objectives. Two commercial texts, *Modern Carpentry* and *Modern Woodworking*, are required but are not provided. The following five films on building techniques are suggested for use as audiovisual aids but are not provided:

MN 6719A	Building Techniques, Foundation and Concrete
MN 6719B	Building Techniques, Framing and Wall Construction
MN 6719C	Framing, Rafter Principles, and Common Rafters
MN 6719F	Building Techniques; Fundamentals of Stair Layout
MN 6719E	Building Techniques, Interior and Exterior Trim

Total number of class instruction hours:	64½
Total number of shop hours:	145
Total number of study hours:	24

CHANGE NOTICE

POI 3ABR55230
(PDS Code NDZ)

1

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PLAN OF INSTRUCTION
(Technical Training)

CARPENTRY SPECIALIST

3-15

AIR TRAINING COMMAND

SHEPPARD TECHNICAL TRAINING CENTER

1 May 1974 - Effective 1 May 1974 with Class 740501
Changed 1 May 1974 - Effective 1 May 1974 with Class 740501
Changed 26 August 1974 - Effective 13 November 1974 with Class 741113
Changed 18 December 1974 - Effective 29 January 1975 with Class 750129

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POI 3ABR55230

LIST OF CURRENT PAGES

This POI consists of 54 current pages issued as follows:

Page No.	Issue	Page No.	Issue
*Title	18 Dec 74	15 thru 24	Original
*A	18 Dec 74	25 and 26	1 May 74
i	Original	27	26 Aug 74
*ii and iii	18 Dec 74	28 and 29	Original
1 and 2	26 Aug 74	30	1 May 74
3	1 May 74	31	26 Aug 74
4	Original	32 and 33	Original
5	1 May 74	34	26 Aug 74
6	Original	35 thru 37	Original
7 and 8	26 Aug 74	38 and 39	26 Aug 74
9	1 May 74	40 and 41	Original
10	Original	42	26 Aug 74
11	26 Aug 74	43	1 May 74
12	Original	44	26 Aug 74
13	1 May 74	Annex (5 pages)	26 Aug 74
14	26 Aug 74		

CHANGE NOTICE INSTRUCTIONS

POI 3ABR55230, 1 May 1974, is changed as follows, effective 29 January 1975, with class 750129:

1. Make pen-and-ink changes identified on pages ii and iii.

2. Insert changed and new pages and remove pages replaced or deleted according to above listing.

3. The (*) in the above page listing indicates that the page is a replacement or addition or has been deleted by this Change Notice.

FOR THE COMMANDER

LEONARD A. HAMILTON, Col, USAF
Chief, Dept of Civil Engineering Tng

DISTRIBUTION: ATC/TTMS-1, AULD-1, SGPM-1, TCE-50, TTOT-1, TTOX-1, TTOR-1, TTE-1, CCAF/AY-2

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DEPARTMENT OF THE AIR FORCE
USAF School of Applied Aerospace Sciences (ATC)
Sheppard Air Force Base, Texas 76311

PLAN OF INSTRUCTION 3ABR55230
(PDS Code NDZ)
1 May 1974

FOREWORD

1. PURPOSE. This plan of instruction prescribes the qualitative requirements for Course 3ABR55230, Carpentry Specialist, in terms of criterion objectives presented by units of instruction, and shows duration, correlation with the training standard, support materials, and instructional guidance. It was developed under the provisions of ATCR 52-33, Instructional System Development, and ATCR 52-7, Plans of Instruction.

2. COURSE DESCRIPTION. Training consists of technical training and related training. In technical training the course trains airmen to perform duties prescribed in AFM 39-1 for Carpentry Specialist, AFSC 55230. Technical training includes an introduction of carpentry and provides instruction on carpenter's hand, portable power, and shop tools; construction and maintenance of wood structures; installation of building hardware; and erection of prefabricated buildings. Related training covers driver education, supplemental military training, troop information program, moral leadership, commander's calls/briefings, etc.

3. EQUIPMENT ALLOWANCE AND AUTHORIZATION. Training equipment required to conduct this course is listed in Equipment Authorization Inventory Data Number 552X000000000. Training equipment authorizations for this course are based on the following Tables of Allowance:

TA 445	Civil Engineering Drafting, Surveying, and Reproduction (USAF)
TA 467	Base Woodworking Shop

NOTE: Group size is shown in parentheses after equipment listed in column 3 of numbered pages of this POI.

4. MULTIPLE INSTRUCTOR REQUIREMENTS. Units of instruction which require more than one instructor per instructional group are identified in the multiple instructor annex to this POI.

5. REFERENCES. This plan of instruction is based on SPECIALTY TRAINING STANDARD 552X0, 15 September 1972, Change 1, 10 May 1973, and Change 2, 17 July 1973, and COURSE CHART 3ABR55230, 16 April 1973.

FOR THE COMMANDER

FRANKLYN C. SNYDER, Colonel, USAF
Chief, Operations Division

Supersedes Plan of Instruction 3ABR55230, 11 July 1973
OPR: Department of Civil Engineering Training
DISTRIBUTION: Listed on page A.

18 December 1974 PEN-AND-INK CHANGES Effective Date: 29 Jan 75 with class 750129

PAGE	PARAGRAPH	COLUMN	ACTION
2	-	3	Change TSCHR 50-30 to read "SCH REG 50-30, Student Orientation and Motivational Procedures"
7	-	3	Under Instructional Guidance delete "AFM 127-101, Industrial Safety" Add "AFR 127-101, Ground"
8	4b(4)	1	Add "BCE Daily Work Schedule (AF Form 1734)"
11	7b	1	Change to read "Using supplies and tools provided, use, clean, oil, and store measuring and layout tools, saws, planing and . . ."
11		3	Under STS Reference add "6a(1)" beside column 1, reference 7b
14	10	1	After tools delete the "period (.)" and add a "colon (:)"
17 18 20 22 23	- - - - -	3 3 3 3 3	Under Instructional Guidance delete "AFM 127-101, Industrial Safety" Add "AFR 127-101, Ground"

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18 December 1974 PEN-AND-INK CHANGES Effective Date: 29 Jan 75 with class 750129

PAGE	PARAGRAPH	COLUMN	ACTION
24	-	3	Under Instructional Guidance delete "AFM 127-101, Industrial Safety" Add "AFR 127-101, Ground"
25	-	3	
39	5	1	Delete "a."
39	-	3	Under column reference delete "a"
42	7	1	Delete "a."
42	-	3	Under column 1 reference delete "a"

MODIFICATIONS

Units 1, 2, 3 & 4 of this publication has (have) been deleted in adapting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.

PLAN OF INSTRUCTION (Continued)

[illegible] OBJECTIVES 1	DURATION HOURS 2	SUPPORT MATERIALS AND GUIDANCE 3
5. Shop Math a. Given the formula and the dimensions of squares and rectangles in feet and inches, compute their areas. b. Given items of building materials of various dimensions, compute the board feet in each item. c. Given the dimensions of building material items, the number of items and cost per board foot, compute the cost of the materials.	3 Day 2	**Column 1 Reference** — **STS Reference** 5a, 5b — 7c 5c — 7d **Instructional Materials** SG 3ABR55230-I-5, Shop Math WB 3ABR55230-I-5-P1, Mathematics Math Pretest **Audio Visual Aids** None **Training Equipment** None **Training Methods** Discussion (2 hrs) Performance (1 hr) **Instructional Environment/Design** Classroom (3 hrs) Group/Lockstep: Proficiency Advancement **Instructional Guidance** Have students complete the math pretest to determine their ability to handle simple math. Adjust level of subject to students' abilities. Have the students complete the workbooks.
6. Publications delete a. Using the technical order index, locate three given TO numbers and titles.	6 Day 3	**Column 1 Reference** — **STS Reference** 6a — 3a 6b — 3c, 3e 6c — 3c 6d — 3f 6e — 3b, 3d

PLAN OF INSTRUCTION NO	DATE	BLOCK NO	PAGE NO
3ABR55230	Changed 1 May 1974	I	9

PLAN OF INSTRUCTION (Continued)

1 UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
b. Using the applicable technical order, locate the procedures for sharpening and storing of carpenters' tools. c. Using TO 00-5-1, locate the procedures for maintaining TOs and commercial publications. d. Using TO 00-5-1, locate the procedures for reporting TO deficiencies. e. Using the numerical index, AFR 0-2, locate publication numbers and titles.		Instructional Materials ✓SG AFS 53, 54, 55, 56, All Courses, Publications ✓WB 3ABR55230-I-6-P1, Using Standard Publications ✓School Technical Order File Audio Visual Aids None Training Equipment None Training Methods Discussion and Demonstration (3 hrs) Performance (3 hrs) Instructional Environment/Design Classroom (6 hrs) Group/Lockstep: Proficiency Advancement Instructional Guidance Make a limited school file of TOs available to each student. Permit students to handle the literature as you identify and describe its purpose. Have students locate specified TO numbers and titles. Students will use TO index to locate specific information. The following references should be used in preparing this lesson: TO 00-5-1, AF Technical Order System AFR 5-4, Publications Numbering System AFR 8-2, Air Force Technical Order System.

PLAN OF INSTRUCTION NO 3ABR55230	DATE 1 May 1974	BLOCK NO. I	PAGE NO. 10

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION HOURS	SUPPORT MATERIALS AND GUIDANCE

7. **Hand Tools**

6
Day 4

a. Given pictures of selected hand tools, identify them as to their use.

b. Using supplies and tools provided, use, ~~clean~~ clean, oil, and store measuring and layout tools, ~~saws~~ saws, planing and shaping tools, drilling and boring tools, hammers, screwdrivers, and clamping tools.

c. Sharpen a woodworking tool in accordance with TO 32-1-101.

Column 1 Reference	STS Reference
7a	8a
7b	8a, 8d, 6a(1)
7c	8c

Instructional Materials
SG 3ABR55230-I-7, Hand Tools
WB 3ABR55230-I-7-P1, Hand Tools
Textbook: Modern Carpentry, Willis H. Wagner, Goodheart-Willcox Co, Inc., Copyright 1969

Audio Visual Aids
None

Training Equipment
Woodworking Hand Tools
Bench Grinders (4)
Oilstones

Training Methods
Discussion and Demonstration (4 hrs)
Performance (2 hrs)

Instructional Environment/Design
Classroom (4 hrs)
Laboratory (2 hrs)
Group/Lockstep: Proficiency Advancement

Instructional Guidance
Tools will be used in the classroom discussion to support the lesson. In the shop area, the instructor will demonstrate the use and care of the handtools to the class. The instructor will then have the students use the tools, checking their performance and making needed corrections.

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
		The following references should be used in preparing this lesson: TO 32-1-101, Maintenance and Care of Hand Tools TO 32-1-151, Hand, Measuring and Power Tools Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc., Copyright 1969
8. Building Materials a. Given a list of wood types and examples of uses of wood, select the proper type of wood for a specific job. b. Match a description of plywood with a picture of the backstamp. c. Given a list of nominal lumber sizes, match each size with a list of actual dressed dimensions. d. Given a list of common lumber grades and description of each grade, match each grade with its description. e. Given an example of building hardware, identify each example as to type and use.	6 Day 5	Column 1 Reference: 8a, 8b, 8c, 8d, 8e STS Reference: 7c Instructional Materials SG 3ABR55230-I-8, Building Materials WB 3ABR55230-I-8-P1, Building Materials Textbook: Modern Carpentry, Willis H. Wagner, Goodheart-Willcox Co., Inc., Copyright 1969 Audio Visual Aids None Training Equipment Wood Types, Identification Boards (12) Examples of Plywood (1) Training Methods Discussion (5 hrs) Performance (1 hr) Instructional Environment/Design Classroom (6 hrs) Group/Lockstep: Proficiency Advancement

PLAN OF INSTRUCTION NO	DATE	BLOCK NO.	PAGE NO
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PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
		Instructional Guidance Discuss and point out examples of plywoods, descriptions of various grades of lumber and examples of building hardware, explaining where each type could be used in building construction. The last hour will be spent filling out the workbooks. The following reference should be used in preparing this lesson: Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.
9. Interpreting Drawings	12 Days 6 and 7	**Column 1 Reference** — **STS Reference** 9a, 9b, 9c, 9d, 9e — 7a 9f — 7b
a. Match a written description of construction drawings with the name of each type of drawing.	(1)	**Instructional Materials** SG 3ABR55230-I-9, Interpreting Drawings WB 3ABR55230-I-9-P1, Interpreting Drawings
b. Given a series of scaled lines, use an architect's scale to measure their length.	(1)	Textbook: Modern Carpentry, Willis H. Wagner, Goodheart-Willcox. Co., Inc., Copyright 1969
c. Match the name of drawing symbols with a picture of the symbol.	(2)	**Audio Visual Aids** None
d. Given a set of architectural drawings, extract the following information from the drawings:	(5)	**Training Equipment** Architect's Scale Architectural Drawings
(1) Building location on the plot plan and information on the building foundation construction		**Training Methods** Discussion/Demonstration (6 hrs) Performance (6 hrs)
(2) Sizes and spacing of structural framing members		**Instructional Environment/Design** Classroom (12 hrs) Group/Lockstep: Proficiency Advancement

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PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION HOURS 2	SUPPORT MATERIALS AND GUIDANCE 3
(3) Types and sizes of window and door units (4) Location of wall partitions and closets (5) Sizes and installation of cabinets		**Instructional Guidance** The class instructor will cover the use of the architect's scale and demonstrate its use to the class. The class instructor will observe and correct the students' performance in their completion of exercises involving use of the architect's scale and interpretation of drawings. Provide several choices of simple projects for students to sketch. The following reference should be used in preparing this lesson: Textbook: Modern Carpentry. The Goodheart-Willcox Co., Inc.
e. Using a set of building specifications, extract the following information: (1) General requirements (2) Standards of workmanships (3) Quality of materials (4) Provisions for changes	(2)	
f. Make a working sketch of a carpentry project to be constructed in days 8, 9 and 10. Specifications and dimensions will be provided by the instructor.	(1)	
10. Project Construction Cut and assemble a specified project, using woodworking hand tools: a. Pieces of the project must be cut to specified dimensions.	16 Days 8 thru 10	Column 1 Reference: 10 — STS Reference: 13b **Instructional Materials** SG 3ABR55230-I-10, Project Construction WB 3ABR55230-I-10-P1, Project Construction Textbook: Modern Carpentry, Willis H. Wagner. Goodheart-Willcox Co., Inc., Copyright 1969

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
b. All edges and angles of the project will be checked with a try or sliding T-bevel square for accuracy. c. All work must be sanded before assembly. d. Joints of the project must fit tightly and not have an excessive amount of glue. e. The completed project must be square and the dimensions must be within specifications.		**Audio Visual Aids** None **Training Equipment** Carpenter's Hand Tools **Training Methods** Discussion (2 hrs) Performance (14 hrs) **Instructional Environment/Design** Classroom (2 hrs) Laboratory (14 hrs) Group/Lockstep: Proficiency Advancement **Instructional Guidance** Students will construct a project specified by the class instructor, using carpentry hand tools. Instructor will observe students for correct usage of the hand tools and make needed corrections. The instructor will check all student projects after completion. The following reference should be used in preparing this lesson: Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.
11. Related Training (identified in course chart)	20	
12. Measurement Test and Test Critique	2 Day 10	

PLAN OF INSTRUCTION	COURSE TITLE Carpentry Specialist
BLOCK TITLE Cabinet Construction	

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
1. Selecting and Cutting Material for Cabinet Construction a. Given a list of required construction material, select the material from the storage area and cut it to length, using the radial arm saw. b. Set up and adjust the jointer and plane one edge of the material that was cut in the previous objective. Planed edge must be square with one surface. c. Set up and adjust the surface planer and surface plane the material that was cut and planed in previous objectives. Thickness of planed material must be in accordance with specifications.	6 Day 11	Column I Reference: Ia, Ib, Ic STS Reference: 6a(1), 6a(2), 6b, 8b, 13b Instructional Materials SG 3ABR55230-II-1, Selecting and Cutting Material for Cabinet Construction WB 3ABR55230-II-1-P1, Selecting and Cutting Material for Cabinet Construction Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc., Copyright 1967 Audio Visual Aids None Training Equipment Radial Arm Saw (4) Jointer (6) Surface Planer (12) Training Methods Discussion (1.5 hr) Demonstration (0.5 hr) Performance (4 hrs) Instructional Environment/Design Classroom (1.5 hr) Laboratory (4.5 hrs) Group/Lockstep: Proficiency Advancement

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PLAN OF INSTRUCTION (Continued)

[illegible]	DURATION HOURS	SUPPORT MAT[illegible]
		Instructional Guidance Discuss the selection of material for cabinet construction and allow each student to select his own material. Discuss the nomenclature and components of the radial arm saw, jointer and surface planer. Describe the cleaning and maintenance of each machine. Demonstrate the procedures for setting up, adjusting and using each machine, stressing safety precautions necessary and their reasons. Have students complete the portion of their workbooks applicable to this unit of instruction. Continuously provide close observation of students during performance. The following references should be used in preparing this lesson: Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc. ~~AFM 127-101, Industrial Safety~~ AFR 127-101, Ground Accident Prevention Handbook
2. Cabinet Framework, Sides and Top a. Using the table saw, rip the material which was cut and planed in the previous objectives to a specified width. b. Using the jointer, plane the ripped edge of the material to a specified width. c. Determine the material required for the sides and top of the cabinet, lay out this material and use the table saw to cut it to width. Comply with given specifications.	6 Day 12	**Column 1 Reference** 2a, 2b, 2c — **STS Reference** 6a(1), 6a(2), 8b, 13b **Instructional Materials** SG 3ABR55230-II-2, Cabinet Framework, Sides and Top WB 3ABR552[illegible]-II-2-P1, Cutting the Framework, Sides and Top for a Cabinet Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc., Copyright 1967 **Audio Visual Aids** None **Training Equipment** Table Saw (3) Jointer (6)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
		Training Methods Discussion (1 hr) Demonstration (0.5 hr) Performance (4.5 hrs) **Instructional Environment/Design** Classroom (1 hr) Laboratory (5 hrs) Group/Lockstep: Proficiency Advancement **Instructional Guidance** Discuss the cabinet project to be built. Discuss the nomenclature and components of the table saw. Describe the cleaning and maintenance of the machine. Demonstrate the procedures for setting up, adjusting and using the table saw. Stress safety precautions and explain why they are necessary. Have students complete the portion of their workbooks applicable to this unit of instruction. Observe students closely during performance. The following references should be used in preparing this lesson: Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc. ~~AFM 127-101, Industrial Safety~~ Accident Prevention Handbook AFR 127-101, Ground
3. Joints a. Set up the mortiser and mortise material for joint openings to specified dimensions. Joints must fit snugly without excessive play. b. Set up the drill press and drill holes for doweled joints as specified. Holes must be aligned so that the jointed pieces will fit tightly.	6 Day 13	**Column 1 Reference** 3a, 3b **STS Reference** 6a(1), 6a(2), 8b, 13b **Instructional Materials** SG 3ABR55230-II-3, Joints WB 3ABR55230-II-3-P1, Using a Mortiser and Drill Press Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc., Copyright 1967 **Audio Visual Aids** None

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
		Training Equipment Mortiser (12) Drill Press (3) Training Methods Discussion (0.75 hr) Demonstration (0.25 hr) Performance (5 hrs) Instructional Environment/Design Classroom (0.75 hr) Laboratory (5.25 hrs) Group/Lockstep: Proficiency Advancement Instructional Guidance Discuss types of joints and their uses. Discuss the nomenclature and components of the mortiser and the drill press. Describe the cleaning and maintenance of the machines. Demonstrate the procedures for setting up, adjusting and using the machines. Stress safety precautions and explain why they are necessary. Have students complete the portion of their workbooks applicable to this unit of instruction. Closely observe students during performance. The following references should be used in preparing this lesson: Textbook: Modern Woodworking, The goodheart-Willcox Co., Inc.
4. Trim Work a. Using the band saw, cut the notch for the toeboard in the cabinet sides to the specified dimensions.	6 Day 14	Column 1 Reference 4a, 4b, 4c STS Reference 6a(1), 6a(2), 8b, 13b Instrutional Material SG 3ABR55230-II-4, Trim Work WB 3ABR55230-II-4-P1, Preparing Trim Work for a Cabinet Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc., Copyright 1967

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
5. Curved Edge Sanding a. Sand material to specifications, using the disc-belt sander. Sanded edges must be smooth. b. Assemble the cabinet, using the parts that were constructed in previous lessons. All joints must be tight and the corners must be square.	6 Day 15	**Column 1 Reference** 5a, 5b **STS Reference** 6a(1), 6a(2), 8b, 13b **Instructional Materials** SG 3ABR55230-II-5, Curved Edge Sanding WB 3ABR55230-II-5-P1, Sanding Curved Edges Textbook: Modern Woodworking, The Goodheart-Willcox Co, Inc., Copyright 1967 **Audio Visual Aids** None **Training Equipment** Disc Belt Sander (6) Carpentry Hand Tools Wood Clamps **Training Methods** Discussion (1 hr) Demonstration (0.25 hr) Performance (4.75 hrs) **Instructional Environment/Design** Classroom (1 hr) Laboratory (5 hrs) Group/Lockstep: Proficiency Advancement **Instructional Guidance** Discuss the construction features and major components of the disc-belt sander. Describe the cleaning and maintenance of the sander. Demonstrate the procedures for using the machine, stressing the safety precautions that must be observed when using the equipment. Discuss the

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
b. Cut an inside curve in cabinet material, following a given pattern, using both the jigsaw and saber saw. Cut should not vary from the pattern more than 1/16". c. Using the lathe, turn stock for the door handles and drawer pulls to specified dimensions.		**Audio Visual Aids** None **Training Equipment** Band Saw (6) Jigsaw (12) Saber Saw (2) Lathe (12) **Training Methods** Discussion (1 hr) Demonstration (0.5 hr) Performance (4.5 hrs) **Instructional Environment/Design** Classroom (1 hr) Laboratory (5 hrs) Group/Lockstep: Proficiency Advancement **Instructional Guidance** Discuss the procedures for transferring designs for drawing to material. Discuss the construction features and major components of the band saw, jigsaw, saber saw, and lathe. Describe the cleaning and maintenance of the machines. Demonstrate the procedures for setting up, adjusting and using the machines. Stress safety precautions and explain why they are necessary. Have students complete the portion of their workbooks applicable to this unit of instruction. Observe students closely during performance. The following references should be used in preparing this lesson: Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc. ~~AFM 127-101, Industrial Safety~~ Accident Prevention Handbook AFR 127-101, Ground

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
		assembly of the cabinet and demonstrate the use of clamps. Have students complete the portion of their workbooks applicable to this unit of instruction. Continually observe students during performance. The following references should be used in preparing this lesson: Textbook: Modern Woodworking, The Goodheart-Willcox Co. . Inc. ~~AFM 127-101, Industrial Safety~~ Accident Prevention Handbook AFR 127-101, Ground
6. Surface Sanding and Decorative Shaping a. Using the shaper, form the lipped edges on the cabinet door and drawer front material. Formed edges must be smooth and uniform. b. Cut decorative inlays in cabinet according to specifications, using the router. c. Sand completed portions of the cabinet to prescribed standards. Sanded portions must be smooth.	6 Day 16	Column 1 Reference 6a, 6b, 6c STS Reference 6a(1), 6a(2), 8b, 13b Instructional Materials SG 3ABR55230-II-6, Surface Sanding and Decorative Shaping WB 3ABR55230-II-6-P1, Surface Sanding and Decorative Shaping Textbook: Modern Woodworking, The Goodheart-Willcox Co. . Inc. Audio Visual Aids None Training Equipment Shaper (6) Router (3) Portable Sander (2) Training Methods Discussion (1 hr) Demonstration (0.25 hr) Performance (4.75 hrs) Instructional Environment/Design Classroom (1 hr) Laboratory (5 hrs) Group/Lockstep: Proficiency Advancement

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
		Instructional Guidance Discuss the purpose of decorative shaping on edges of material for appearance and for proper fitting of doors and drawers. Discuss the construction features and major components of the shaper, router and portable sander. Point out the similarities of the router and shaper. Describe the cleaning and maintenance of each machine. Demonstrate the procedures for setting up, adjusting and operating the router and shaper, and the proper method of replacing belts, adjusting and using the sander. Have students complete the portion of their workbooks applicable to this unit of instruction. Closely observe students during performance. Stress safety throughout the lesson. The following references should be used in preparing this lesson: Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc. ~~AFM 127-101, Industrial Safety~~ Accident Prevention Handbook AFR 127-101, Ground
7. Edge Finishing Smooth and finish sanding cabinet edges. Sanded surfaces must be smooth and free of scratches.	6 Day 17	**Column 1 Reference** 7 — **STS Reference** 6a(1), 6a(2), 8b, 13b **Instructional Materials** SG 3ABR55230-II-7, Edge Finishing WB 3ABR55230-II-7-P1, Sanding Edges Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc. **Audio Visual Aids** None **Training Equipment** Vibrator Sander (2) Carpentry Hand Tools

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
		Training Methods Discussion (0.5 hr) Demonstration (0.25 hr) Performance (5.25 hrs) Instructional Environment/Design Classroom (0.5 hr) Laboratory (5.5 hrs) Group/Lockstep: Proficiency Advancement Instructional Guidance Discuss the selection of sandpaper grits for different steps in finishing. Caution students against oversanding or rounding of edges. Discuss the maintenance and cleaning of the vibrator sander. Demonstrate the proper use of the sander, including the preoperational checks of the machine to insure safe operation. Have students complete the portion of their workbooks applicable to this unit of instruction. Observe students during performance and give assistance where necessary. The following references should be used in preparing this lesson: Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc. ~~AFM 127-101, Industrial Safety~~ Accident Prevention Handbook AFR 127-101, Ground
8. Cabinet Assembly and Finishing	16 Days 18, 19, & 20	Column 1 Reference: 8a, 8b STS Reference: 6a(1), 6a(2), 8b, 13b
a. Complete cabinet construction, using sanders and wood clamps. The cabinet must be square and all joints tight.	(4)	Instructional Materials SG 3ABR55230-II-8, Cabinet Assembly and Finishing WB 3ABR55230-II-8-P1 Cabinet Assembly and Finishing Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc., Copyright 1967

PLAN OF INSTRUCTION NO. 3ABR55230	DATE 1 May 1974	BLOCK NO. II	PAGE NO. 24

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
b. Install cabinet knobs and hinges. Use methods that conform to good carpentry practices as explained in the textbook, Modern Woodworking.	(12)	Audio Visual Aids None Training Equipment Carpentry Handtools Portable Finishing Equipment Training Methods Performance (16 hrs) Instructional Environment/Design Laboratory (16 hrs) Group/Lockstep: Proficiency Advancement Instructional Guidance Students will complete their projects and the instructor will observe all students' cabinets and critique them to show where and how improvements could be made if necessary. The following references should be used in preparing this lesson: Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc. ~~AFM 127-101, Industrial Safety~~ Accident Prevention Handbook AFR 127-101, Ground
9. Related Training (identified in course chart)	20	
10. Measurement Test and Test Critique	2 Day 20	

PLAN OF INSTRUCTION NO. 3ABR55230	DATE Changed 1 May 1974	BLOCK NO. II	PAGE NO 25

PLAN OF INSTRUCTION	COURSE TITLE Carpentry Specialist
BLOCK TITLE Building Construction	

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
1. Foundations and Form Construction a. Given a drawing of footings, foundations, and forms of various types, identify each of the items illustrated. b. Working as a member of a team, measure and cut material, and construct a slab form. The constructed form must be square and level.	6 Day 21	Column 1 Reference — STS Reference 1a — 9a(1), 9a(2), 9a(3), 9a(4), 9a(5) 1b — 9a(2) Instructional Materials SG 3ABR55230-III-1, Foundations and Form Construction WB 3ABR55230-III-1-P1, Constructing Forms and Foundations Audio Visual Aids Film: MN 6719a, Building Techniques, Foundations and Concrete Training Equipment Carpentry Hand Tools Portable Power Tools (6) Multiuse Low Wall Forms (12) Training Methods Discussion (2 hrs) Demonstration (1 hr) Performance (3 hrs) Instructional Environment/Design Classroom (2 hrs) Laboratory (4 hrs) Group/Lockstep: Proficiency Advancement

PLAN OF INSTRUCTION NO. 3ABR55230	DATE Changed 1 May 1974	BLOCK NO. III	PAGE NO. 26

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
		Instructional Guidance Discuss the types and purposes of forms, materials, nails, and braces used in forming. Demonstrate low wall form construction. Have the students construct a slab form. Have the students complete that portion of their workbooks applicable to this unit of instruction. Divide the class into teams for maximum utilization.
2. Light Frame Construction	23 (2 1/2) Days 22 thru 25	**Column 1 Reference** — **STS Reference** 2a — 7a, 10a(1), 10a(2), 10a(3) 2b — 7a, 10a(4) 2c, 2d — 10a(1), 10a(2), 10a(4), 10b, 14a
a. Given a drawing of the framework of a light frame building, locate and identify the major components.	(2)	**Instructional Material** SG 3ABR55230-III-2, Light Frame Construction WB 3ABR55230-III-2-P1, Building a Light Frame Structure
b. Given a framing plan of a wall, locate and identify the major construction features.	(3)	Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc., Copyright 1969
c. Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section for a wood frame structure. Completed structure will have a framed opening for a door and must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.	(7.5)	**Audio Visual Aids** Film: MN 6719B, Building Techniques, Framing and Wall Construction **Training Equipment** Carpentry Hand Tools Portable Power Tools (6) Building Mock-up (12) Framed Building (4)
d. Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section containing a framed opening for a window for a wood frame structure. Completed work must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.	(7.5)	**Training Methods** Discussion (4 hrs) Performance (17 hrs) Self-Instruction (2 hrs)

PLAN OF INSTRUCTION NO 3ABR55230	DATE Changed 26 August 1974	BLOCK NO. III	PAGE NO 27

PLAN OF INSTRUCTION (Continued)

1 UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	2 DURATION (HOURS)	3 SUPPORT MATERIALS AND GUIDANCE
		Instructional Environment Design Classroom (4 hrs) Laboratory (17 hrs) Study Hall (2 hrs) Group/Lockstep Proficiency Advancement **Instructional Guidance** Discuss balloon and platform framing, pointing out the major differences and the advantages of each type. Explain and demonstrate the type and purpose of sills and girders. Discuss the types and spacing of floor joints, pointing out the types and purposes of bridging. Discuss and demonstrate the types and installation of subflooring. Locate and identify wall plates and explain their purpose. Instruct the students to use drawings to locate and identify components of light frame constructions. Discuss the types and spacing of wall studs, and show how the studs are connected to the sole and top plate. Explain the layout of rough openings for doors and windows. Discuss the types and sizes of headers. Explain the purpose and location of wind braces and fire blocks. Have the students use drawings to locate and identify the major construction features of a wall. Show the training film MN-6719B, Building Techniques, Framing and Wall Construction. Demonstrate the use of the portable power saw. Divide the class into equal-size groups and have them disassemble a rough frame building. Make sure that the students remove all the nails and stack the lumber correctly. Have the students lay out, cut and construct a frame wall. Observe students safety and make on-the-spot corrections. Make assignments for self-instruction at the end of day 24.

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
3. Scaffold Construction As a member of a team, erect a single-pole scaffold to a specified working height. Scaffold must conform to safety standards and construction practices outlined in the textbook, Modern Carpentry.	8 (6/2) Days 25,26	The following reference should be used in preparing this lesson: Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc. Column 1 Reference: 3 STS Reference: 6a(3), 9b **Instructional Material** SG 3ABR55230-III-3, Scaffold Construction WB 3ABR55230-III-3-P1, Erecting a Scaffold Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc., Copyright 1969 **Audio Visual Aids** None **Training Equipment** Framed Building (4) Portable Power Hand Tools (6) Carpentry Hand Tools **Training Methods** Discussion (1 hr) Performance (5 hrs) Self-Instruction (2 hrs) **Instructional Environment/Design** Classroom (1 hr) Laboratory (5 hrs) Study Hall (2 hrs) Group/Lockstep Proficiency Advancement

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
		Instructional Guidance Discuss the various types of scaffolds, demonstrating the bracing required. Have students complete the portion of their workbook applicable to this unit of instruction. Students will erect a scaffold on their building, and check it for safety. Make assignemtns for self-instruction at the end of day 25. The following reference should be used in preparing this lesson: Textbook: Modern Carpentry, The Goodheart-Willcox Co. Inc.
4. Roof Construction	21 (15/6) Days 26, 27 & 28	**Column 1 Reference** 4a, 4b **STS Reference** 10a(5)
a. Given the pitch of the roof, the span of the building and a rafter table, calculate the line length of a common rafter for the building.	(3)	**Instructional Material** SG 3ABR55230-III-4, Roof Construction WB 3ABR55230-III-4-P1, Constructing a Roof Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc., Copyright 1969 **Audio Visual Aids** Film: MN 6719C, Framing Rafter Principles and Common Rafter **Training Equipment** Framed Building (4) Carpentry Hand Tools
b. Using a portable electric power saw and carpentry hand tools and working as a member of a team, lay out, cut and construct the roof frame for a wood frame structure. Finished roof frame will include ceiling joists, rafters, ridge board, collar ties, and gable end studs. All materials must be cut within 1/16" of given specifications and all joints must be tight.	(12)	**Training Methods** Discussion and Demonstration (4 hrs) Performance (11 hrs) Self-Instruction (6 hrs)

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PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION HOURS 2	SUPPORT MATERIALS AND GUIDANCE 3
		Instructional Environment/Design Classroom (4 hrs) Laboratory (11 hrs) Study Hall (6 hrs) Group/Lockstep Proficiency Advancement **Instructional Guidance** Discuss the various types of roofs and point out the advantages and construction features of each type. Explain that we will construct a gable roof in this course. Discuss and demonstrate the parts and use of a framing square. Discuss and demonstrate the different types of rafters. Demonstrate the method of laying out a common rafter. Explain the purpose and layout of ridge boards, collar ties, and gable end studs. Emphasize safety at all times. Have the students complete that part of the workbook applicable to this lesson. Make assignments for self-instruction at the end of days 26, 27, and 28. The following reference should be used in preparing this lesson: Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.
5. Porches and Stairs a. As a member of a team, lay out and cut stair stringers, and construct a set of stairs for a given application. The finished work must be within 1/16" of given specifications and must be plumb and level. b. Construct a porch for an existing building. The porch must be sturdy, have the correct drop and be ready for painting.	8 (6/2) Day 29	**Column 1 Reference** — **STS Reference** 5a — 10a(6), 13a(9) 5b — 10c **Instructional Materials** SG 3ABR55230-III-5, Porches and Stairs WB 3ABR55230-III-5-P1, Porches and Stairs Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc., Copyright 1969 **Audio Visual Aids** Film: MN 6719F, Building Techniques - Fundamentals of Stair Layout

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PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
		Training Equipment Carpentry Hand Tools Portable Power Tools **Training Methods** Discussion and Demonstration (3 hrs) Performance (3 hrs) Self-Instruction (2 hrs) **Instructional Environment/Design** Classroom (3 hrs) Laboratory (3 hrs) Study Hall (2 hrs) Group/Lockstep: Proficiency Advancement **Instructional Guidance** Discuss the layout and construction of porches and porch foundations. Show training film, MN 6719F, Building Techniques - Fundamentals of Stair Layout. Discuss the different types of stairs. Define stair layout terms. Emphasize that tread plus riser must not be less than 17 inches or more than 18 inches. Divide the class into equal-size groups and have them lay out and construct a set of stairs. Enforce safety precautions. Make assignments for self-instruction at the end of day 29. The following reference should be used in preparing this lesson: Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.
6. Sheathing Working as a member of a team, install sheathing on the outside of a wall and on the top of roof rafters. Joints must be tight and staggered. Nail spacing must be within standard specifications.	6 (4/2) Day 30	**Column 1 Reference** 6 **STS Reference** 11a(1), 12a(1) **Instructional Material** SG 3ABR55230-III-6, Sheathing WB 3ABR55230-III-6-P1, Installing Sheathing Textbook: Modern Carpentry

PLAN OF INSTRUCTION (Continued)

1 UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	2 DURATION (HOURS)	3 SUPPORT MATERIALS AND GUIDANCE
		Audio Visual Aids None Training Equipment Carpentry Hand Tools Framed Building (4) Training Methods Discussion (1 hr) Performance (3 hrs) Self-Instruction (2 hrs) Instructional Environment/Design Classroom (1 hr) Laboratory (3 hrs) Study Hall (2 hrs) Group/Lockstep: Proficiency Advancement Instructional Guidance Discuss the types and purposes of sheathing, and explain how each type is installed. Have the students install sheathing on studs and rafters. Observe the students very closely for workmanship and safety. Make on-the-spot corrections. Make assignments for self-instruction at the end of day 30. The following reference should be used in preparing this lesson: Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.
7. Related Training (identified in the course chart)	6	
8. Measurement Test and Test Critique	2 Day 30	

PLAN OF INSTRUCTION

COURSE TITLE Carpentry Specialist

Building Finish Work

[illegible] ION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2
1. Roofing and Siding	16 (12/4) Days 31,32
a. Working as a member of a team, prepare sheathing for roofing or siding by removing ridges or high spots, repairing holes larger than 1" diameter, and applying building paper.	(2)
b. Working as a member of a team, apply roofing of a given type so that exposure equals that recommended by the manufacturer, courses are straight, and material is properly fastened.	(4)
c. Working as a member of a team, install trim and cornice on the surface designated. Openings in joints must not exceed 1/16" and trim must be properly fastened with the recommended fastener.	(2)
d. Working as a member of a team, install siding on a vertical wall. The spacing and splice joints must be within standard specifications. The courses must be even and the material properly fastened.	(4)

SUPPORT MATERIALS AND GUIDANCE
3

Column 1 Reference	STS Reference
1a	6a(1), 6a(3), 11b
1b	6a(1), 6a(3), 12b
1c	6a(1), 6a(3), 11a(6), 12a(2)
1d	11a(2)

Instructional Materials
SG 3ABR55230-IV-1, Roofing and Siding
WB 3ABR55230-IV-1-P1, Roofing and Siding
Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc., Copyright 1969

Audio Visual Aids
None

Training Equipment
Building Mock-up (12)
Carpentry Hand Tools

Training Methods
Discussion (3 hrs)
Demonstration (1 hr)
Performance (8 hrs)
Self-Instruction (4 hrs)

Instructional Environment/Design
Classroom (3 hrs)
Laboratory (9 hrs)
Study Hall (4 hrs)
Group/Lockstep: Proficiency Advancement

PLAN OF INSTRUCTION NO. 3ABR55230 | DATE Changed 26 August 1974 | BLOCK NO. IV | PAGE NO. 34

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
		Instructional Guidance Discuss the types and purpose of building paper. Demonstrate the method of installing the strips to allow for top and side lap and to eliminate excessive wrinkling. Demonstrate the use of various fasteners. Discuss the various types of roofing materials and explain their advantages and disadvantages. Supervise the students as they install building paper, roofing materials, siding and trim. Observe precautions and make on-the-spot corrections. Make assignments for self-instruction at the end of days 31 and 32. The following references should be used in preparing this lesson: AFM 85-4, Maintenance and Construction Methods for Buildings and Structures Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.
2. Doors and Finish Hardware	16 (12/4) Days 33, 34	**Column 1 Reference** / **STS Reference** 2a — 6a(1), 11a(5) 11a(6), 13a(6) 2b — 6a(1), 11a(6), 13a(8) 2c — 6a(1), 13a(2) 2d — 13g
a. Working as a member of a team, install a door frame and door in an existing opening. The head jamb must be level and the side jambs plumb. The door must open and close without binding.	(6)	**Instructional Materials** SG 3ABR55230-IV-2, Doors and Finish Hardware WB 3ABR55230-IV-2-P1, Doors and Finish Hardware Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc., Copyright 1969
b. Measure, cut, and install trim. All joints must be tight and neat in appearance.	(2)	**Audio Visual Aids** Training Film: MN 6719E, Interior and Exterior Trim
c. Working as a member of a team, install weatherstripping so it will eliminate the possibility of drafts.	(2)	

1 UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	2 DURATION (HOURS)	3 SUPPORT MATERIALS AND GUIDANCE
d. Install a door lock and hinge on a simulated door. Door must lock securely and must open and close without binding.	(2)	**Training Equipment** Mitre Boxes (3) Building Mock-up (6) Carpentry Hand Tools **Training Methods** Discussion and Demonstration (4 hrs) Performance (8 hrs) Self-Instruction (4 hrs) **Instructional Environment/Design** Classroom (4 hrs) Laboratory (8 hrs) Study Hall (4 hrs) Group/Lockstep: Proficiency Advancement **Instructional Guidance** Discuss the types, sizes, hardware, and installation procedures of interior and exterior door and door frames. Explain the necessity for cutting away of flooring for the installation of conventional exterior door frames. Demonstrate the methods of laying out and installing locks and hinges. Have each student install a lock and hinge in a simulated door. Discuss the types, purpose, advantages, and installation procedure of trim and weatherstripping. Demonstrate the methods of cutting trim. Supervise the students as they cut and install trim and weatherstripping. Observe safety and make on-the-spot corrections. Make assignments for self-instruction at the end of days 33 and 34. The following references should be used in preparing this lesson: AFM 85-4, Maintenance and Construction Methods for Buildings and Structures Textbook: Modern Carpentry, The Goodheart-Willcox Col, Inc.

PLAN OF INSTRUCTION (Continued)

1 UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	2 DURATION (HOURS)	3 SUPPORT MATERIALS AND GUIDANCE

3. Vents, Louvers, and Window Installation

a. Working as a member of a team, install a window frame and sash in an existing opening. The head jambs must be level and the side jambs plumb. The sash must operate freely without binding.

b. Repair a window sash by replacing glass. Putty must be smooth and must not show from the backside of the frame.

c. Repair a window screen by replacing screen wire on a frame. The screen wire must be tight and free from buckles and wrinkles.

d. As a member of a team, install a louver or ventilator in an existing opening. The louver must be square, plumb, and/or level.

8
(6/2)
Day 35

Column 1 Reference	STS Reference
3a	11a(3)
3b	11c
3c	11a(4)
3d	11a(7)

Instructional Materials
SG 3ABR55230-IV-3, Vents, Louvers, and Window Installation
WB 3ABR55230-IV-3-P1, Vents, Louvers and Window Installation
Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc., Copyright 1969

Audio Visual Aids
None

Training Equipment
Louver (6)
Window Frame (4)
Building Mock-up (3)
Carpentry Hand Tools

Training Methods
Discussion (1 hr)
Demonstration (1 hr)
Performance (4 hrs)
Self-Instruction (2 hrs)

Instructional Environment/Design
Classroom (1 hr)
Laboratory (5 hrs)
Study Hall (2 hrs)
Group/Lockstep: Proficiency Advancement

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PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION HOURS	SUPPORT MATERIALS AND GUIDANCE

Instructional Guidance
Discuss the types and main parts of windows. Discuss the installation of both wooden and aluminum windows. Demonstrate window repair. Supervise the students very closely while they are cutting and handling glass. Make on-the-spot safety corrections. Make assignments for self-instruction at the end of day 35.

The following references should be used in preparing this lesson:
AFM 85-4, Maintenance and Construction Methods for Buildings and Structures
Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.

4. Insulation, Interior Walls, Flooring, and Prefab Units — 12 Days 36 & 37

a. Working as a member of a team, install insulation in an existing wall with exterior sheeting. The insulation must be smooth, and the vapor barrier and reflective surface properly placed. (1)

b. Working as a member of a team, install gypsum board on an existing wall section. The spaces between the adjoining pieces must not exceed 1/4 inch. (2)

c. Working as a member of a team, install acoustical material on a ceiling. The borders must be symmetrical and the surface smooth. (2)

d. Working as a member of a team, install paneling on an existing wall section. Each panel must be plumb, and the joints tight and inconspicuous. (1)

Column 1 Reference	STS Reference
4a	13a(1)
4b	13a(3)
4c	13a(5)
4d	13a(4)
4e	10a(3), 13a(7)
4f	13e
4g	13f
4h	13c
4i	13d

Instructional Materials
SG 3ABR55230-IV-4, Insulation, Interior Walls, Flooring, and Prefab Units
WB 3ABR55230-IV-4-P1, Insulation, Interior Walls, Flooring, and Prefab Units
Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc, Copyright 1969

Audio Visual Aids
None

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
c. Working as a member of a team, install subflooring and then install wood flooring on the subfloor. The flooring must run parallel with the longest side of the room, the nails must not show, and the joints must be tight and neat.	(1)	Training Equipment Building Mock-up (12) Tacker-Stapler (1) Carpentry Hand Tools Training Methods Discussion and Demonstration (4 hrs) Performance (8 hrs)
f. Repair a wooden floor by removing the damaged section. The repaired section must be tight and inconspicuous.	(1)	Instructional Environment Design Classroom (4 hrs) Laboratory (8 hrs) Group/Lockstep: Proficiency Advancement
g. Repair asphalt flooring by removing and replacing damaged sections. Repaired section must be smooth and without bulges, and all joints must be tight and inconspicuous.	(2)	Instructional Guidance Discuss the types, purposes and advantages of building insulation. Demonstrate the correct way to install insulation. Discuss the various types of interior wall coverings, including a brief description of plastered walls, gypsum board walls, acoustical tile, and paneling. Demonstrate how to measure, cut, and nail gypsum board. Demonstrate how to lay out the starting lines for ceiling and floor tile. Discuss how to lay out and repair hardwood flooring. Demonstrate the use of toggle bolts. Have the students complete that portion of their workbooks which applies to this lesson.
h. Working as a member of a team, install a prefabricated cabinet or bookcase on a wall. Installed unit must be level and secure enough to hold its designed weight.	(1)	
i. Working as a member of a team, install a section of laminated plastic. The finished job must have a smooth surface with maximum adhesion.	(1)	The following reference should be used in preparing this lesson: AFM 85-4, Maintenance and Construction Methods for Buildings and Structures Textbook: Modern Carpentry, The Goodheard-Wilcox Co., Inc.
5. Prefabricated Building Erection a. As a member of a team, assemble and erect a metal building on an existing foundation. The building must be square, the walls plumb, and the building components secure.	11 Days 38 and 39	Column 1 Reference 5a STS Reference 14b

PLAN OF INSTRUCTION NO.	DATE	BLOCK NO.	PAGE NO.
3ABR55230	Changed 26 August 1974	IV	39

1 UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	2 DURATION (HOURS)	3 SUPPORT MATERIALS AND GUIDANCE
		Instructional Materials SG 3ABR55230-IV-5, Prefabricated Building Erection WB 3ABR55230-IV-5-P1, Prefabricated Building Erection Manufacturer's Assembly and Erection Procedures for a Metal Prefab Building Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc., Copyright 1969 **Audio Visual Aids** None **Training Equipment** Metal Prefabricated Building (12) Common Hand Tools **Training Methods** Discussion (2 hrs) Performance (9 hrs) **Instructional Environment/Design** Classroom (2 hrs) Laboratory (9 hrs) Group/Lockstep: Proficiency Advancement **Instructional Guidance** Discuss the types and advantages of prefab buildings. Explain the advantages of following the manufacturer's drawings and instructions. Demonstrate the method of laying out the building and how to use the tools. Have the students erect a metal prefab building. Observe the students closely for both workmanship and safety. The following reference should be used in preparing this lesson: Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.

PLAN OF INSTRUCTION (Continued)

<table>
<tr><th>UNITS OF INSTRUCTION AND CRITERION OBJECTIVES
1</th><th>DURATION (HOURS)
2</th><th>SUPPORT MATERIALS AND GUIDANCE
3</th></tr>
<tr><td>6. Heavy Timber Construction

a. Working as a member of a team, position a heavy timber with a hoist.

b. Working as a member of a team, cut heavy timbers to a specific dimension, as required for repair of heavy timber structures.</td><td>1
Day 39</td><td><table><tr><th>Column 1 Reference</th><th>STS Reference</th></tr><tr><td>6a</td><td>15a</td></tr><tr><td>6b</td><td>15b</td></tr></table>
Instructional Materials
✓SG 3ABR55230-IV-6, Heavy Timber Construction

Audio Visual Aids
None

Training Equipment
Crosscut Saw (6)
Docking Saw (6)
Hoisting Device (12)
Common Hand Tools (2)

Training Methods
Discussion (0.25 hr)
Performance (0.75 hr)

Instructional Environment/Design
Classroom (0.25 hr)
Laboratory (0.75 hr)
Group/Lockstep: Proficiency Advancement

Instructional Guidance
Discuss the purposes, applications, and advantages of heavy timber construction. Demonstrate the use of such special tools as crosscut and docking saws, timber carriers, cant hooks, peaveys, timber fasteners, and hoisting devices. Observe the students when they are using crosscut and docking saws and hoisting devices. Enforce safety precautions.

The following reference should be used in preparing this lesson:
TM 5-4C0, Carpentry and Building Construction.</td></tr>
</table>

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
7. Man-hour and Material Estimation a. Given a simple carpentry project, estimate the type and amount of materials, the amount of man-hours, tools and equipment required to complete the project and state the method of reporting material deficiencies.	2 Day 40	**Column 1 Reference** 7a **STS Reference** 5i, 7c, 7d **Instructional Materials** SG 3ABR55230-IV-7, Man-hour and Material Estimation WB 3ABR55230-IV-7-P1, Man-hour and Material Estimation **Training Methods** Discussion (1 hr) Performance (1 hr) **Instructional Environment/Design** Classroom (2 hrs) Group/Lockstep: Proficiency Advancement **Instructional Guidance** Review the BCE structural chart with emphasis on the planning section. Explain the duties of both the planning section and the individual worker in regard to work orders and day-to-day work. Have the students compute the man-hours and materials needed for a simple carpentry project. The following reference should be used in preparing this lesson: NAVDOCKS Publication, Engineering Performance Standards

PLAN OF INSTRUCTION NO. 3ABR55230	DATE Changed 26 August 1974	BLOCK NO. IV	PAGE NO. 42

PLAN OF INSTRUCTION (Continued)

[illegible] TION AND CRITERION OBJECTIVES	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
8. Communication Security a. Identify information as classified, unclassified, or of possible intelligence value. b. Determine proper classification to be assigned official information. c. Select and recommend mode of transmission dictated by security and expediency required. d. List security precautions involved in voice communications.	1 Day 40	Column 1 Reference / STS Reference 8a 2a 8b 2b 8c 2c 8d 2d Instructional Materials 2TPT-9205-03, Communication Security Audio Visual Aids None Training Equipment None Training Methods Performance (1 hr) Instructional Environment/Design Classroom (1 hr) Group/Lockstep: Proficiency Advancement Instructional Guidance Have students complete the self-study package, 2TPT-9205-03, Communication Security. When the students have completed the text and answered the questions, discuss the answers. The following reference should be used in preparing this lesson: AFR 205-7, Communications Security

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION INCLUDING CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
9. Related Training (identified in course chart)	10	
10. Measurement Test and Test Critique	2 Day 40	
11. Course Critique and Graduation	1 Day 40	

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COURSE CHART

NUMBER	POS CODE	DATE
3ABR55230	NDZ	16 April 1973

TECHNICAL TRAINING COURSE TITLE
Carpentry Specialist

ATC OPR & APPROVAL DATE
TTMS, 17 August 1970

SUPERSEDES COURSE CHART
3ABR55230
3 November 1972

CENTER OPR
Sheppard/TTOXU

DEPARTMENT OPR
Department of Civil Engineering Training

COURSE SECURITY CLASSIFICATION
UNCLASSIFIED

LOCATION OF TRAINING
Sheppard AFB, Texas 76311

LENGTH OF TRAINING

Technical Training (Table II)	264	Hours
Related Training (Table III)	56	Hours
	320	Total Hours (8 Weeks, 0 Days)

3-15

APPLICABLE TRAINING STANDARD
STS 552X0, 15 September 1972

INSTRUCTIONAL DESIGN
Proficiency Advancement: Group/Lock Step

REMARKS

Effective date: 11 July 1973 with class 730711. All previous enrolled classes will continue to be governed by course chart dated 3 November 1972.

TABLE I – MAJOR ITEMS OF EQUIPMENT

Carpenter's Hand Tools
Portable Electric Carpentry Tools

Carpentry Shop Tools
Table Saw
Radial Saw
Band Saw
Jig Saw
Sander
Mortiser
Lathe
Drill Press
Surfacer
Jointer
Shaper
Grinder

Instructional Support Devices
Building Foundations
Concrete Forms
Floor Framing
Roof Framing
Wall Framing
Sheathing

Trainers
Building Structure (Model)
Roof Truss Construction (Model)
Prefabricated Building

ATC FORM NOV 72 449 PREVIOUS EDITION OBSOLETE.

COURSE CHART – TABLE II – TRAINING CONTENT 3ABR55230

NOTE: This table documents the 8–hour training day. It shows time spent on technical training and related training identified on page 1 but does not show time spent on individual assistance offered the student outside the 8–hour day.

HRS PER DAY / WK OF TNG	1 2 3 4 5 6	7 8
1 2	Course Material - UNCLASSIFIED 60 Hours TT BLOCK I - Introduction to Carpentry Orientation and Course Introduction (2 hrs); Base Civil Engineer Organization and Career Field Orientation (2 hrs); Safety (2 hrs); Project and Resource Management (3 hrs); Shop Math (3 hrs); Publications (6 hrs); Hand Tools (6 hrs); Building Materials (6 hrs); Interpreting Drawings (12 hrs); Project Construction (16 hrs); Measurement Test and Test Critique (2 hrs). (Safety as Applicable) 60 Hours C/L	46 Hours Related Training (RT) See Table III
3 4	Course Material - UNCLASSIFIED 60 Hours TT BLOCK II - Cabinet Construction Selecting and Cutting Material for Cabinet Construction (6 hrs); Cabinet Frame Work Sides and Top (6 hrs); Joints (6 hrs); Trim Work (6 hrs); Curved Edge Sanding (6 hrs); Surface Sanding and Decorative Shaping (6 hrs); Edge Finishing (6 hrs); Cabinet Assembly and Finishing (16 hrs); Measurement Test and Test Critique (2 hrs). (Safety as Applicable) 60 Hours C/L	
5 6	Course Material - UNCLASSIFIED 74 Hours TT BLOCK III - Building Construction Foundations and Form Construction (6 hrs); Light Frame Construction (21 hrs); Scaffold Construction (6 hrs); Roof Construction (15 hrs); Porches and Stairs (6 hrs); Sheathing (4 hrs); Measurement Test and Test Critique (2 hrs). (Safety as Applicable) 60 Hours C/L	14 Hours Complementary Technical Training (CTT)

COURSE CHART – TABLE II – TRAINING CONTENT 3ABR55230

OTE: This table documents the 8-hour training day. It shows time spent on technical training and related training identified on page 1 d does not show time spent on individual assistance afforded the student outside the 8-hour day.

WK OF TNG / HRS PER DAY	1 2 3 4 5 6	7 8
7 8	Course Material – UNCLASSIFIED 70 Hours TT BLOCK IV - Building Finish Work Roofing and Siding (12 hrs); Doors and Finish Hardware (12 hrs); Vents, Louvers, and Window Installation (6 hrs); Insulation, Interior Walls, Flooring and Prefab Units (12 hrs); Prefabricated Building Erection (11 hrs); Heavy Timber Construction (1 hr); Man-hour and Material Estimation (2 hrs); Communication Security (1 hr); Measurement Test and Test Critique (2 hrs); Course Critique, ~~Driver Safety~~, and Graduation (1 hr). (Safety as Applicable) 60 Hours C/L	10 Hours CTT See Table III 10 Hours RT See Table III

TECHNICAL TRAINING (TT)		264 Hours
Classroom/Laboratory (C/L)	240 Hours	
Complementary Technical Training (CTT) (self-instruction)	24 Hours	
RELATED TRAINING (RT)		56 Hours
Sq Commander's Calls/Briefings (safety, security, WAPS, UCMJ briefings)	10 Hours	
Traffic Safety	14 Hours	
Supplemental Military	20 Hours	
Commander's Call	2 Hours	
~~Appointments, End of Course~~ Predeparture Safety Briefing (ATCR 127-1) and Appointments	10 Hours	
TOTAL		320 Hours

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APPROVAL OFFICE AND DATE TCETC, 1May74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER I	BLOCK TITLE Introduction to Carpentry

LESSON TITLE
Shop Math (Day 2)

LESSON DURATION		
CLASSROOM/LABORATORY	SUPPLEMENTARY	TOTAL
3 hours	0	3 hours

POI REFERENCE		
PAGE NUMBER	POI DATE	PARAGRAPH
9	1 May 1974	5

STS REFERENCE	
NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL			
SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION			
EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
None	None	None	SG I-5, Shop Math WB I-5-P1, Mathematics Math Pretest

CRITERION OBJECTIVES AND TEACHING STEPS

5a. Given the formula and the dimensions of squares and rectangles in feet and inches, compute their areas.

(1) Area of squares and rectangles

(2) Formula

5b. Given items of building materials of various dimensions, compute the board feet in each item.

(1) Definition of board feet

(2) Computing the board feet of 2 x 4s

(3) Computing the board feet of various types of lumber

ATC FORM AUG 72 770

U.S. GPO: 1973 779-300/33

5e. Given the dimensions of building materials items, the number of items, and cost per board foot, compute the cost of the materials.

(1) Formula for computing lumber cost

(2) Methods of computing lumber cost

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3ABR55230

Day 2, Unit 5

Branch Approved Robert S. [illegible]

Date 1 May 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (160 Min)

PRESENTATION:

5.a. Given the formula and the dimensions of squares and rectangles in feet and inches, compute their areas.

- (1) Area of squares and rectangles
  - (a) Is the product of two dimensions
  - (b) Gives square area, square inches, feet, and yards
- (2) Formula
  - (a) Multiply length times width or height
  - (b) Examples: 12ft x9ft 108 sq. ft.

$$\begin{array}{r} 12\text{ft} \\ \underline{\times 9\text{ft}} \\ 108 \text{ sq. ft.} \end{array}$$

1 Find the area of a building 29 feet wide and 40 feet long

2 How many square yards of carpet will be needed to cover a living room floor 15' x 26'?

3 How many floor tile 9 inches square will be needed to cover the floor of a living room 16' x 14'?

4 How many square feet of paneling are needed to cover the walls of a living room 14' x 16' x 8'?

APPLICATION:

Given the formula and the dimensions of squares and rectangles in feet and inches, compute their areas

PRESENTATION:

5.b. Given items of building materials of various dimensions, compute the board feet in each item.

(1) Definition of board feet

(a) A board foot is a piece of material 1" thick by 12" wide by 12" long

(b) Material less than 1" in thickness should still be figured as having a thickness of 1"

(c) Example: Find the number of board feet in a piece of lumber 1" x 8" x 12'

$$\frac{1'' \times 8'' \times 12'}{12} = \frac{8}{1} = 8 \text{ bd ft}$$

(d) To compute board feet in more than one piece, insert the number of pieces into the formula

(2) Computing the board feet of 2 x 4s

(a) Examples: Find the number of board feet in 18 pcs of lumber 2" x 4" x 16'

(b)

$$\frac{3 \text{ pcs x } 1 \text{ x } 4'' \text{ x } 16'}{12} = 192 \text{ bd ft}$$

(3) Computing the board feet of various types of lumber

(a) How many board feet are in a piece of lumber 1" x 8" x 14'?

(b) Find the number of board feet in 24 pieces of 4" x 4" x 16'

(c) How many board feet are in 200 pcs of 1½" x 8" x 12' of material

(d) Find the number of board feet in 64 pcs of 2" x 4" x 8' wall members

PPLICATION:

Given items of building materials of various dimensions, compute the board feet in each item.

PRESENTATION:

5.c. Given the dimensions of building materials items, the number of items, and cost per board foot, compute the cost of the materials.

(1) Formula for computing lumber cost

(a) Insert cost into the board feet formula

(b) Figure cost in decimal equivalent

(2) Methods of computing cost

(a) "M" is the symbol used to represent one thousand

(b) Examples: Find the cost of a stack of lumber containing 222 pcs of 2" x 12" x 12' at $185.00 per "M"

$$\frac{.185 \times 222 \times 2'' \times 12'' \times 12'}{12} = 222$$

```
  222
  x 4
  888
 444
 5328 bd ft
x 185
26640
42624
5328
$985.68 Total
        cost of
        lumber
```

1 What is the cost of 24 pcs of 1" x 8" x 14' at $185.00 per "M"

2 Find the cost of 400 pcs of 2" x 12" x 18' at $165.00 per "M"

3 Find the cost of 24 pcs of 1" x 8" x 14" at $185.00 per "M"

4 What is the price of 62 pcs of 1" x 10" x 18' at $195.00 per "M"

APPLICATION:

Given the dimensions of building material items, the number of items, and cost per board foot, compute the cost of the materials.

EVALUATION:

1. Observe students performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (15 Min)

SUMMARY:

DEMOTIVATION:

ASSIGNMENT AND CLOSURE:

Read SG AFS 53, 54, 55, 56, All Courses, Publications.

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APPROVAL OFFICE AND DATE TCETC/19Dec74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER I	BLOCK TITLE Introduction to Carpentry
LESSON TITLE Hand Tools (Day 4)	

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 hours	0	6 hours

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
11	26 Aug 74	7

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Woodworking Hand Tools Bench Grinders Oilstones	None	None	SG I-7 WB I-7-P1 Modern Carpentry, Textbook

CRITERION OBJECTIVES AND TEACHING STEPS

7a. Given pictures of selected hand tools, identify them as to their use.

(1) Measuring and layout

(2) Saws

(3) Planing, Smoothing, and Shaping

(4) Drilling and Boring

(5) Hammers

(6) Screwdrivers

(7) Clamping Tools

LESSON PLAN (Part I, General) CONTINUATION SHEET

CRITERION OBJECTIVES AND TEACHING STEPS (Continued)

7b. Using supplies and tools provided use, clean, oil and store measuring and layout tools, saws, planing and shaping tools, drilling and boring tools, hammers, screwdrivers, and clamping tools

(1) Measuring and layout

(2) Saws

(3) Planing, smoothing, and shaping

(4) Drilling and boring

(5) Hammers

(6) Screwdrivers

(7) Clamping Tools

7c. Sharpen a woodworking tool in accordance with TO 32-1-101.

(1) Wood chisels

(2) Plane irons

3ABR55230

Day 4, Unit 7

Branch Approved

Date 23 JAN 1975

PART II

INTRODUCTION (10 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (340 Min)

PRESENTATION:

7.a. Given pictures of selected hand tools, identify them as to their use.

(1) Measuring and layout

(a) The standard 6 ft folding rule is indispensable; some folding rules will have a metal slide for making inside measurements

(b) Tapes range in size from 6 to 12 feet; they are also available in lengths of 50 ft and longer

(c) Framing squares are used in building layout; the tongue of the square is 16" long and 2" wide. The heel is the point at which the tongue and body meet

(d) Try squares are used to check squareness of surfaces and edges. The handle will be wood or metal; the blade will be 6 to 12" long

(e) Sliding T-Bevels have an adjustable blade and will have a wood or metal handle; useful in laying out cuts for hip and valley rafters

(f) Combinations squares are used to lay out miter joints, and as a gauging tool; this tool has two basic parts - a 12" blade; stockhead

(g) Standard level size is 24" long; the body may be wood or metal. This tool is used in checking vertical and horizontal measurement

(h) Chalklines are an easy way to mark long, straight lines. A chalkline consists of a metal case with 100 feet of string

(2) Saws

(a) Cross-cut saws range in size from 24 to 26 inches, having 7 to 10 points per inch and are used to cut across wood grain

- (b) Rip saws are from 28 to 30 inches long, having 5 to 7 points per inch and used in cutting with wood grain
- (c) Back saws have a reinforced blade with 14 to 16 points per inch. This tool is used mostly in a miter box
- (d) Keyhole saws have an interchangeable narrow blade; used for irregular cuts or where work space is limited
- (e) Hacksaws have adjustable frames to hold blades 8 to 16 inches long; hacksaw blades will have from 14 to 32 teeth per inch

(3) Planing, Smoothing, and Shaping

- (a) Block planes range in size from 6 to 7 inches in length; this plane produces a fine, smooth cut and is desirable in fitting and trim work
- (b) Smooth Planes range from 8 to 9 inches in length; used to smooth rough surfaces where straight edges are not required
- (c) Jack planes may be used for all-purpose work; the average length of a jack plane is 14 inches
- (d) Paring chisels are light-duty chisels for shaping and preparing work and always operated by hand

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(e) Firmer chisels are medium-duty chisels, used for light mortising or paring; this tool is used with hand or mallet

(f) Framing or mortising chisels are heavy-duty chisels used for making deep cuts

(g) Utility knives vary in shape, but are used for all purpose work by the carpenter

(4) Drilling and Boring

(a) Braces are used to hold wood bits and turn them into the wood; brace size is determined by the diameter of the sweep swing

(b) Auger bits range in common sizes of 1/4 to 1 inch; the size will be stamped on the tang as a whole number indicating the number of 16ths in the size of the bit

(c) Hand drills have a capacity of 1/4 inch for most drill bits; this tool will use twist drill bits and is especially useful for light work

(d) Push drills are designed to drill small holes; fluted bits ranging from 1/16 to 3/16 will be used in making pilot holes for nails and screws

(e) Countersinks have a cone-shaped head and are used in a brace to form the recess for screw heads

(f) Screwdriver bits are used in a brace to set wood screws

(g) Expansive bits replace several bits because they can be adjusted to bore holes from 7/8 to 3 inches in diameter

(5) Hammers

(a) Curved claw hammers vary in weight from 7 to 20 ounces; the 13 ounce is popular for general purpose work. The weight of the hammer head determines the size of a hammer

(b) Straight-claw hammers are used especially in rough framing or demolition work; the 16 to 20 ounce hammer is average for this type of work

(c) Mallets have a head made of plastics or rawhide; this tool is used to strike a surface without damage

(d) Half-hatchets have short wooden handles, a head with a broad hammer-like face with a straight cutting edge at the other end. This tool is used primarily for roughing

(6) Screwdrivers

(a) Standard screwdrivers are used to drive or turn the one-slot type of screw or bolt; screwdriver size is determined by measuring from the ferrule to the tip of the tool

(b) Phillips screwdrivers are used to turn screws which have two slots that intersect at the center. Size of a Phillips screwdriver is given as point number

(c) Spiral ratchet screwdrivers can use various screwdriver bits; this tool has a ratchet adjustment and is especially useful in fastening a large number of screws

(7) Clamping Tools

(a) C-clamp can be used to clamp jigs or fixtures to machines and to hold stock together while adhesive sets. C-clamps are available in sizes from 1" to 12"

(b) Handscrew Clamps distribute pressure over a wide area; sizes (length of jaw) range from 4 to 24 inches

APPLICATION:

Given pictures of selected hand tools, identify them as to their use.

PRESENTATION:

7.b. Using supplies and tools provided, use, clean, oil and store measuring and layout tools, saws, planing and shaping tools, drilling and boring tools, hammers, screwdrivers, and clamping tools.

(1) Measuring and Layout

(a) Folding rules should be kept closed when not in use; joints should be clean and well oiled to prevent breakage of the tool

(b) Steel tapes should be kept dry and lightly oiled; care should be exercised to avoid kinking the tape

(c) Care of squares can be performed by laying them on flat surfaces only, wiping off immediately when they become damp, and removing dirt with an application of a light coat of oil before storing

(d) Levels should be stored when not in use to prevent damage to the surface; wood levels should have a preservative covering applied to prevent drying

(e) Chalklines should be filled and string in good repair; the hand crank should always be locked after use

(2) Saws

(a) Keep new blades lightly oiled and stored in a dry place. If rust appears, remove with fine emery cloth and apply oil immediately

(b) Sharpening saws consists of four major steps - jointing, shaping, setting, and sharpening

(3) Planing, smoothing, and shaping

(a) Chisels can be kept sharp by whetting the edge on an oilstone unless the edge is nicked; in this case, grinding is necessary. The bevel of a chisel should be two times the chisel's thickness

(b) Planes not is use should be placed on the side. Before storage, a light coat of oil should be applied to prevent rusting and the blade withdrawn

(4) Drilling and boring

(a) Brace and hand drill. Always remove bits before storing, tighten all screws and lubricate the ratchet assembly, oil lightly all metal parts before storage

(b) Auger bits should be stored in a rack. Sharpen auger bits with an auger bit file, following the original bevel of the bit's lips; final sharpening will be finished with a slipstone

(c) Twist bits should be stored in a dry place after use in a special cloth container to keep bits separated; bits should receive a light coat of oil before storage

(d) Countersinks should be wrapped in cloth to protect the cutting flutes. Sharpening will be done with a slipstone; if the countersink is nicked, a tapered triangular file is used

(5) Hammers

(a) Hammerheads can be restored original shape by grinding if badly damaged; rough spots will be removed with emery paper

(b) Hammer handles will be checked before and after use for grease and cracks; special attention will be given to tightness of the hammerhead

(6) Screwdrivers

(a) Screwdriver blades should be ground so the tip is square. The tip should be thinned on each side, and the tip's sides ground alike in shape and angle

(b) Handle repair is difficult. Usually, handles will not be replaced, but rough handles can be smoothed with a wood rasp and sandpaper

(7) Clamping Tools

(a) C-clamp threads should be kept clean and rust free; the swivel head should be checked for rough spots and repaired with a smooth file and abrasive paper when needed

(b) Handscrew clamps should have a light coat of oil applied to the metal parts of the clamp. The hardwood jaws should be varnished when the finish becomes damaged

APPLICATION:

Using supplies and tools provided, use, clean, oil and store measuring and layout tools, saws, planing and shaping tools, drilling and boring tools, hammers, screwdrivers, and clamping tools.

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PRESENTATION:

7.c. Sharpen a woodworking tool in accordance with TO 32-1-101.

(1) Wood chisels

(a) Set up grinding machine

1 Clamp chisel on tool rest

2 Square cutting edge and remove nicks

3 Adjust tool rest on grinder to position which will give correct bevel. (Approximately 42°)

4 Reshape bevel by moving chisel from side to side

(b) Whetting

1 Clean oilstone and place enough oil on it to wet surface

2 Place chisel on stone with bevel parallel to stone

3 Hold chisel firmly and move it back and forth along entire length of stone

4 Place flat side of chisel on stone and move it back and forth along length of stone to remove wire edge

5 Repeat stoning of bevel and flat side until chisel is sharp

(2) Plane irons (follow same procedures as above)

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APPLICATION:

Sharpen a woodworking tool in accordance with TO 32-1-101.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

Read Unit 4, Building Materials, in textbook, Modern Carpentry, and answer the 12 questions at end of unit.

LESSON PLAN (Part I, General)

APPROVAL OFFICE/DATE TCETC/1May74	INSTRUCTOR
URSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER I	BLOCK TITLE Introduction to Carpentry

LESSON TITLE
Building Materials (Day 5)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 hrs	0	6 hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
12	1 May 1974	8

STS/CTS REFERENCE

NUMBER	DATE
STS 552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
ood Types, Identification Boards Examples of Plywood	None	None	SG I-8 WB I-8-P1 Textbook: Modern Carpentry

CRITERION OBJECTIVES AND TEACHING STEPS

8a. Given a list of wood types and examples of uses of wood, select the proper type of wood for a specific job.

(1) Ash
(2) Beech
(3) Sycamore
(4) Birch
(5) Cedar
(6) Black walnut
(7) Cypress
(8) Fir
(9) Maple

(10) Mahogany
(11) Hickory
(12) Pine
(13) Redwood

8b. Match a description of plywood with a picture of the backstamp.

(1) Purpose of the backstamp
(2) Information on the backstamp
(3) Grades of veneer on panel back
(4) Group number
(5) Plywood designation
(6) Identification index
(7) Product standard names

8c. Given a list of nominal lumber sizes, match each size with a list of actual dressed dimensions.

(1) Nominal lumber sizes
(2) Dressed dimensions
(3) Types and uses of wood
(4) Grades of lumber
(5) Descriptions of each grade of lumber
(6) Methods of grading lumber
(7) Lumber defects

8d. Given a list of common lumber grades and description of each grade, match each grade with its description.

(1) Common grades
(2) Select grades

8e. Given an example of building hardware, identify each example as to type and use.

(1) Nails
(2) Screws
(3) Bolts
(4) Special fasteners
(5) Hinges
(6) Locks and Locking devices

ABR55230 Branch Approved Robert P Fenner

Day 5, Unit 8 Date 1 May 1974

PART II

INTRODUCTION (10 Min)

ATTENTION:

OVERVIEW:

OTIVATION:

BODY (340 Min)

PRESENTATION:

8.a. Given a list of wood types and examples of uses of wood, select the proper type of wood for a specific job.

- (1) Ash
- (2) Beech
- (3) Sycamore
- (4) Birch
- (5) Cedar

(6) Black walnut

(7) Cypress

(8) Fir

(9) Maple

(10) Mahogany

(11) Hickory

(12) Pine

(13) Redwood

APPLICATION:

Given a list of wood types and examples of uses of wood, select the proper type of wood for a specific job.

PRESENTATION:

8.b. Match a description of plywood with a picture of the backstamp

(1) Purpose of the backstamp

(a) Designates species

(b) Strength

(c) Type of glues

(d) Finish - appearance

(2) Information on the backstamp

(a) Grade of veneer on panel face

1 N: Special order, select free of open defects. Natural finish

2 A: Smooth, neat repairs. Also used for natural finishes

3 B: Circular repair plugs and tight knots permitted

4 C: Limited splits, knotholes do not exceed certain limits; knotholes up to 1"

5 C: Improved: much improved c-veneer with splits limited to 1/8" in width, knotholes from ¼" to ½" are permitted

6 D: Permits knotholes up to 2½" in width, limited splits permitted

(b) Grade of veneer on panel back

(3) Grades of veneer on panel back

(a) Same as grades on panel face

(b) Must be specified when ordering

(4) Group number

(a) Designates strength

(b) Divided into four major groups; 1-4

(c) The smaller the group number the stronger the species of wood

(d) The region of growth of a tree has a bearing on the growth rate; the slower it grows, the stronger it will be.

(5) Plywood designation

(a) Interior - interior glues

(b) Exterior - waterproof glues

(6) Identification index

  (a) Pair of numbers separated by a slash (/)

  (b) Left number indicates maximum allowable support spacing when used for roof decking

  (c) Right number indicates maximum allowable support spacing when used for sub flooring

(7) Product standard names

  (a) Standard

  (b) Structural

  (c) Underlayment

  (d) Plugged

  (e) Plyform

APPLICATION:

Match a description of plywood with a picture of the backstamp

PRESENTATION:

8.c. Given a list of nominal lumber sizes, match each size with a list of actual dressed dimensions.

(1) Nominal lumber sizes

  (a) Used when listing, or calculating size and amount of lumber

  (b) Is rough, unfinished measurement of lumber

  (c) Nominal sizes are sometimes listed in quarters. Example: 1¼ in material is given as 5/4

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(2) Dressed dimensions

- (a) Sizes established by American Lumber Standards
- (b) Actual measurements of dressed lumber
- c) Lumber can be obtained with two sides surfaced (S2S) or all four surfaced (S4S)

(3) Types and uses of wood

- (a) Hardwoods
  - 1 Oak - Flooring, furniture
  - 2 Walnut - Quality furniture, cabinet work
  - 3 Birch - Doors, dowel-pins, plywoods
  - 4 Mahogany - Paneling, boat building
  - 5 Maple - Floors for bowling alleys, tool handles
- (b) Softwoods
  - 1 Douglas Fir - Vast amounts used for plywoods, wall and roof framing
  - 2 Redwoods - Outside finish work, shingles, furniture
  - 3 White Pine - Interior and exterior trim
  - 4 Cedar - Shingles, siding, utility poles
  - 5 Yellow Pine - Building frame construction

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(4) Grades of lumber

   (a) Yard lumber: Consists of grades for general building purposes where the piece is used as a whole

   (b) Structural lumber: Intended for construction where specific stress values have been assigned

   (c) Factory/Shop lumber: Where the lumber is to be cut up in furniture manufacture

(5) Descriptions of each grade of lumber

   (a) No. 1 Common: is sound, tight knotted, containing only a few minor defects

   (b) No. 2 Common: Contains only a limited number of defects, no knot holes, must be grain-tight

   (c) No. 3 Common: Contains few defects, much more course than No. 2 common, will have occasional knotholes

   (d) No. 4 Common: Is low quality material containing defects, knot-holes, checks, shakes, and decay

   (e) No. 5 Common: Capable of holding together under normal handling, least desirable of wood types for construction work

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(6) Methods of grading lumber

- (a) National Bureau of Standards for the Department of Commerce: Publishes and distributes rules for the grading of lumber species
- (b) Lumber is divided into groups; Select Lumber and Common Lumber
- (c) Each grade has sub-divisions in order of quality

(7) Lumber defects

- (a) Knots: Caused by imbedded branch or tree limb, considered strength reducing
- (b) Checks: A separation of the grain, lengthwise, caused by rapid drying
- (c) Wane: The presence of bark or absence of wood along the edge of grain of a board. Due to this bevel, the wood is not the same width
- (d) Blue Stain: A blemish, caused by a mold fungus. It does not weaken the wood
- (e) Decay: Deterioration caused by various kinds of fungi
- (f) Warp: A general term applied to various types of shrinkage or distortions

APPLICATION:

Given a list of nominal lumber sizes, match each size with a list of actual dressed dimensions.

PRESENTATION:

8.d. Given a list of common lumber grades and description of each grade, match each grade with its description

(1) Common grades

(a) No. 1 common

(b) No. 2 common

(c) No. 3 common

(d) No. 4 common

(e) No. 5 common

(2) Select grades

(a) Grade A: Lumber is select, practically free of defects and blemishes

(b) Grade B: Lumber is select, containing a few minor blemishes

(c) Grade C: Contains more numerous defects, must be capable of being easily covered with paint

(d) Grade D: Will have blemishes, defects, must be capable of presenting a satisfactory appearance when painted

APPLICATION:

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Given a list of common lumber grades and description of each grade, match each grade with its description

PRESENTATION:

8.e. Given an example of building hardware, identify each example as to type and use

(1) Nails

(a) Common nails

1 Has a heavy cross-section, designed for rough framing

2 Sizes range from 2d-1 inch to 60d which is 6 inches in length

(b) Casing nails

1 Has a small conical head

2 Sizes: 2d to 20d

3 Uses: Finish carpentry, doors and window casings, and trim work

(c) Box nails

1 Have head; thin cross-section

2 Sizes: 2d to 20d

3 Uses: Toenailing in frame construction, light work

(d) Finish nails

1 Have the smallest head and thinnest cross-section

2 Sizes: 2d to 20D

3 Uses: Interior finish work; use a nail set

- (e) Roofing nails
  - 1 Will have a zinc coating
  - 2 Sizes: ½ inch to 2½ inches in length
  - 3 Have a large head
  - 4 Uses: Holding roofing to plywood
- (f) Duplex nails
  - 1 Have double heads
  - 2 Uses: Temporary construction, formwork, scaffolds

(2) Screws

- (a) Parts of a screw
  - 1 Head
  - 2 Shank
  - 3 Root diameter
- (b) Types of screws
  - 1 Flathead
  - 2 Roundhead
  - 3 Oval head
  - 4 Lag screws
- (c) Advantages of screws
  - 1 Greater holding power
  - 2 Neater appearance
  - 3 Easy to remove

- (3) Bolts
    - (a) Carriage
        - 1 Round head - Square section underneath
        - 2 Length: 3/4" to 20"
        - 3 Diameter: 3/16" to 3/4"
    - (b) Machine
        - 1 Square or hex head
        - 2 Length: ½" to 30"
        - 3 Diameter: ¼" to 1 3/4"
    - (c) Stove
        - 1 Slotted, flat or round head
        - 2 Length: 1/8" to 6"
        - 3 Diameter: 3/32" to 5/8"
- (4) Special fasteners
    - (a) Expansion shields
        - 1 Used in anchoring materials to concrete
        - 2 Two parts - the shield and lag screw
        - 3 Length: 1½" to 3½"
    - (b) Toggle bolts
        - 1 Two parts - flat or round head
        - 2 Length - 2½" to 6"
        - 3 Uses: To fasten fixtures to walls

- (5) Hinges
  - (a) Butt (Full Mortise)
    - 1 Two leaves
    - 2 Removable or stationary pins
    - 3 Sizes: Measure length and width open
    - 4 Uses: Hanging doors
  - (b) Strap
    - 1 Three parts: Leaves, pins, and knuckles
    - 2 Sizes: 3 to 16 inches in length
    - 3 Uses: Hanging temporary doors and gates
  - (c) Surface
    - 1 Mounted on door and casings surface
    - 2 Uses: Cabinet work
  - (d) Spring
    - 1 Mounted same as surface
    - 2 Spring loaded
    - 3 Uses: Screen doors
- (6) Locks and Locking devices
  - (a) Mortise lock
    - 1 Door must be mortised out for lock, difficult to install

        2 Strike plate - Fastens to the jamb

        3 Escutcheon plate - Cover plates on both sides of door; has knob on it

        4 Lock housing - Fits in mortised opening

    (b) Rim lock

        1 Mounted above regular passage lock set

        2 Hole must be bored in door for installation

    (c) Passage lock

        1 Is mounted in door

        2 Has lock button in knob

        3 Template is furnished for installation

        4 Also available without locking device

APPLICATION:

Given an example of building hardware, identify each example as to type and use.

EVALUATION:

1. Observe students performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

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CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

Read SG 3ABR55230-1-9
interpreting drawings

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LESSON PLAN (Part I, General)

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[illegible] TCETC/1May74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER I	BLOCK TITLE Introduction to Carpentry

LESSON TITLE
Interpreting Drawings (Days 6 and 7)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
12 hours	0	12 hours

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
13	Changed 1 May 1974	9

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Architect's Scale Architectural Drawings	None	None	SG I-9 WB I-9-P1 Textbook, Modern Carpentry

CRITERION OBJECTIVES AND TEACHING STEPS

9a. Match a written description of construction drawings with the name of each type of drawing

(1) Plot or site-plan
(2) Foundation plan
(3) Floor plan
(4) Framing-plan
(5) Elevations
(6) Sections
(7) Details

9b. Given a series of scaled lines, use an architect's scale to measure their length.

(1) Application and advantages of an architect's scale
(2) The faces of an architect's scale
(3) Using an architect's scale

9c. Match the name of drawing symbols with a picture of the symbol.

(1) Types of drawing symbols
(2) Architectural terms

9d. Given a series of architectural drawings, extract the following information from the drawing:

(1) Building location on the plot plan and information on the building foundation construction
(2) Sizes and spacing of structural framing members
(3) Types and sizes of window and door units
(4) Location of wall partitions and closets
(5) Sizes and installation of cabinets

(a) Purpose and use of architectural drawing
(b) Methods of using architectural drawings

9e. Using a set of building specifications, extract the following information

(1) General requirements
(2) Standards of workmanship
(3) Quality of materials
(4) Provisions for changes

(a) Purpose and use of building specifications
(b) Methods of using building specifications

9f. Make a working sketch of a carpentry project to be constructed in Days 8, 9, and 10. Specifications and dimensions will be provided by the instructor.

(1) Freehand sketches
(2) Dimensioning
(3) Making a working sketch

- 3ABR55230

Days 6 and 7, Unit 9

Branch Approved

Date 1 May 1974

PART II

INTRODUCTION (10 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (700 Min)

PRESENTATION:

9.a. Match a written description of construction drawings with the name of each type of drawing

(1) Plot or site-plan

(a) Shows construction site boundaries

(b) Ground contours, roads, walks, and utility lines

(c) Plans are drawn to scale after the area is surveyed

(2) Foundation plan

(a) Starting point for actual construction of a building

(b) Shows the size, type of construction, and materials

(3) Floor plan

(a) A cross-sectional view of a building

(b) Floor plans are drawn to represent the complete layout of a building

(c) Shows outside shape of the building, size of rooms, location of doors and windows

(d) Location of heating, lighting, and plumbing fixtures

(e) Are usually drawn to scale of ¼" equals 1 foot or 3/16" equals 1 foot

(4) Framing-plan

(a) Separate plans will be furnished for the floor, roof and wall

(b) Shows the size, number, and location of structural members that form building frameworks

(5) Elevations

(a) Shows front, rear and sides of a structure

- (b) Materials used to cover the outside of a building are shown
- (c) Gives important vertical dimensions

(6) Sections

- (a) Shows interior construction
- (b) Used to show how a structure would look if it were cut vertically

(7) Details

- (a) Shows parts better than a section
- (b) Drawn to an enlarged scale

APPLICATION:

Match a written description of construction drawings with the name of each type of drawing.

PRESENTATION:

9.b. Given a series of scaled lines, use an architect's scale to measure their length

(1) Application and advantages of an architect's scale

- (a) Used to reduce objects to a scaled size for drawing purposes
- (b) Keeps drawing in true perspective

(2) The faces of an architect's scale

- (a) Full scale

1 Each inch is divided into 16 equal parts

2 One part: 1/16 of an inch

(b) Three quarters size

1 Is divided into units of 3/4 of an inch

2 Each 3/4 unit is divided into 32 equal parts

(c) Half size

1 Is divided into units of ½ inch

2 Each half inch is divided into 16 equal parts

(d) Three-eights size

1 Divided into units of three eighths of one inch

2 Each 3/8 unit is divided into 12 equal parts

(e) Quarter size

1 Divided into units of one quarter inch

2 Each unit is divided into 6 equal parts

(3) Using an architect's scale

(a) Do not use as a straightedge for drawing lines

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(b) Make as many measurements as possible with the scale in one position to avoid cumulative error

(c) Never place the points of a compass or divider on the scale

APPLICATION:

Given a series of scaled lines, use an architect's scale to measure their length

PRESENTATION:

9.c. Match the name of drawing symbols with a picture of the symbol

(1) Types of drawing symbols

(a) Building materials

(b) Plumbing symbols

(c) Electrical Symbols

(2) Architectural terms

(a) Abbreviations for items due to lack of space on prints

(b) Example: OC = On Center
CEM = Cement

APPLICATION:

Match the name of the drawing symbols with a picture of the symbol.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (Day 6)

SUMMARY:

ASSIGNMENT:

Read Unit 5, Modern Carpentry text and answer the 12 questions at the end of the text

INTRODUCTION (Day 7)

MOTIVATION:

REVIEW:

OVERVIEW:

PRESENTATION:

9.d. Given a series of architectural drawings, extract the following information from the drawing:

(1) Building location on the plot plan and information on the building foundation construction

(2) Sizes and spacing of structural framing members

(3) Types and sizes of window and door units

(4) Location of wall partitions and closets

(5) Sizes and installation of cabinets

    (a) Purpose and use of architectural drawings

- 1 Graphic description of each part of construction
- 2 Used to show everything from the boundaries of the construction site to the final details required to complete construction

(b) Methods of using architectural drawings

- 1 Locations
  - a Location of building in relationship to boundaries
  - b Location of utility lines
- 2 Structural framing members
  - a Sizes of material
  - b Areas where material will be used
  - c Number of pieces required
  - d Spacing of members
- 3 Window and door units
  - a Size of doors and windows
  - b Framing allowance
  - c Types of door and windows
  - d Hardware to be used on doors
- 4 Wall partitions and closets

  - a Thickness of walls
  - b Length of partitions
  - c Height of partitions
  - d Depth and width of closets
  - e Width of shelves
  - f Types and size of closet doors
- 5 Cabinets
  - a Type and use of cabinets
  - b Cabinet materials
  - c Cabinet height, width, and depth
  - d Shelf and drawer installation

APPLICATION:

Given a series of architectural drawings, extract the following information from the drawing:

(1) Building location on the plot plan and information on the building foundation construction

(2) Sizes and spacing of structural framing members

(3) Types and sizes of window and door units

(4) Location of wall partitions and closets

(5) Sizes and installation of cabinets

PRESENTATION:

9.e. Using a set of building specifications, extract the following information

(1) General requirements

(2) Standards of workmanships

(3) Quality of materials

(4) Provisions for changes

- (a) Purpose and use of building specifications
    - 1 Describe all materials and give detailed instructions concerning the building
    - 2 All information not contained in drawings will be in specifications
- (b) Methods of using building specifications
    - 1 General requirements
        - a Conditions and information regarding building permits
        - b Contract payment provisions, bonding, and insurance
    - 2 Standards of materials
        - a Eliminates a conflict of opinions
        - b Types of material to be used
        - c Interior and exterior finishings
        - d Quality of acceptable workmanship
    - 3 Quality of materials
        - a Grade
        - b Species

            c Size

            d Moisture content for various parts of the building

        4 Provision for changes

            a Made by the architect

            b Minor changes can be handled by the workman

            c Sketches or notations can be used to avoid misunderstandings

APPLICATION:

Using a set of building specifications, extract the following information:

(1) General requirements

(2) Standards of workmanships

(3) Quality of materials

(4) Provision for changes

PRESENTATION:

9.f. Make a working sketch of a carpentry project to be constructed in Days 8, 9, and 10. Specifications and dimensions will be provided by the instructor

(1) Freehand sketches

    (a) Should be done with paper loose on the drawing board

    (b) Mark the end points of lines to be drawn

    (c) To draw a curve, establish several points along the curve site

    - (d) Finish lines will be very dark lines

  - (2) Dimensioning

    - (a) Fine solid lines with arrowheads at each end

    - (b) Will be used with extension lines

    - (c) Number sizes are used to show measurements

  - (3) Making a working sketch

APPLICATION:

Make a working sketch of a carpentry project to be constructed in Days 8, 9, and 10. Specifications and dimensions will be provided by the instructor.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE

Textbook, Modern Carpentry and WB-1-P1, Project Construction.

APPROVAL OFFICE AND DATE	INSTRUCTOR
TCETC/4Sep74	

COURSE NUMBER	COURSE TITLE
3ABR55230	Carpentry Specialist
BLOCK NUMBER	**BLOCK TITLE**
I	Introduction to Carpentry

LESSON TITLE

Project Construction (Days 8 thru 10)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
16 hours	0	16 hours

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
14	26 August 1974	10

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Carpenter's Hand Tools	None	None	SG I-10 WB I-10-P1 Textbook: Modern Carpentry

CRITERION OBJECTIVES AND TEACHING STEPS

10. Cut and assemble a specified project, using woodworking hand tools:

a. Pieces of the project must be cut to specified dimensions

b. All edges and angles of the project will be checked with a try or sliding T-bevel square for accuracy

c. All work must be sanded before assembly

d. Joints of the project must fit tightly and not have an excessive amount of glue

e. The completed project must be square and the dimensions must be within specifications

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LESSON PLAN (Part I, General) CONTINUATION SHEET

CRITERION OBJECTIVES AND TEACHING STEPS (Continued)

(1) Cutting to specified dimensions

(2) Checking edges and angles

(3) Sanding project material

(4) Project joints

(5) Project completion

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3ABR55230 Branch Approved Robert S Fenno

Days 8 thru 10, Unit 10 Date 1 May 1974

PART II.

INTRODUCTION (10 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (940 Min)

PRESENTATION:

10. Cut and assemble a specified project, using woodworking hand tools.
    a. Pieces of the project must be cut to specified dimensions
        (1) Project material will be measured with a steel tape or folding rule

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(2) Allow 1/16th to 1/8th inch additional material for finishing

b. All edges and angles of the project will be checked with a try or sliding T-bevel square for accuracy

(1) All 90° cuts on project ends or edges will be checked with a try or combination square

(2) All angles cut on project material will be checked with a sliding T-bevel for accuracy

c. All work must be sanded before assembly

(1) Sandpaper will be selected for type of sanding to be done

(2) All sanding will be in the grain direction

(3) A sanding block can be used to avoid rounding 90° project ends or edges

d. Joints of the project must fit tightly and not have an excessive amount of glue

(1) Joints will fit tight

(2) Apply a small amount of glue between all joints

(3) Wood filler will be used to repair wood joints if needed

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e. The completed project must be square and the dimensions must be within specifications

(1) Cutting to specified dimension

(a) Project will be constructed to exact specified dimensions

(b) Dimensions will be provided by instructor

(2) Checking edges and angles

(a) Check all 90° cuts with a try or combination square

(b) Check all angles with a T-bevel square

(3) Sanding project material

(a) All pieces will be sanded prior to assembly

(b) Sanding will be done with the grain and a sanding block will be used

(4) Project joints

(a) All joints will be tight and fitted properly

(b) Wood filler, if used will be used sparingly

(5) Project completion

(a) Completed project will be checked by instructor for squareness

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(b) Project size will
also be checked for
specified dimensions
and quality of appearance

APPLICATION:

Cut and assemble a specified project, using woodworking hand tools

EVALUATION:

1. Observe students performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (Day 8)

SUMMARY:

ASSIGNMENT:

Review notes of Day 7 and read SG 3ABR55230-1-10, Project Contruction.

INTRODUCTION (Day 9)

MOTIVATION:

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REVIEW:

OVERVIEW:

APPLICATION (Continued)

Cut and assemble a specified project using woodworking hand tools.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (Day 9)

SUMMARY:

ASSIGNMENT:

Review notes of Day 7 and read SG 3ABR55230-1-10, Project Construction.

INTRODUCTION (Day 10)

MOTIVATION:

REVIEW:

OVERVIEW:

APPLICATION (Continued)

Cut and assemble a specified project, using woodworking hand tools.

EVALUATION:

1. Observe students performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

LESSON PLAN (Part I, General)

PPROVAL OFFICE AND DATE CETC/1May74	INSTRUCTOR
URSE NUMBER ABR55230	COURSE TITLE Carpentry Specialist
LOCK NUMBER II	BLOCK TITLE Cabinet Construction

LESSON TITLE
Selecting and Cutting Material for Cabinet Construction (Day 11)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 Hrs	0	6 Hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
16	1 May 1974	1

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
adial Arm Saw Jointer Surface Planer			SG II-1 WB II-1-P1 Textbook, Modern Woodworking

CRITERION OBJECTIVES AND TEACHING STEPS

1a. Given a list of required construction material, select the material from the storage area and cut it to length, using the radial arm saw.

(1) Types of radial arm saws
(2) Nomenclature
(3) Operation
(4) Safety

1b. Set up and adjust the jointer and plane one edge of the material that was cut in the previous objective. Planed edge must be square with one surface.

(1) Nomenclature
(2) Operation
(3) Safety

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LESSON PLAN (Part I, General) CONTINUATION SHEET

CRITERION OBJECTIVES AND TEACHING STEPS (Continued)

1c. Set up and adjust the surface planer and surface plane the material that was cut and planed in previous objectives. Thickness of planed material must be in accordance with specifications.

(1) Nomenclature
(2) Operation
(3) Safety

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ABR55230 Branch Approved John Paulson

Day 11, Unit 1 Date 1 MAY 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION

BODY (345 Min)

PRESENTATION:

1.a. Given a list of required construction material, select the material from the storage area and cut it to length, using the radial arm saw.

   (1) Types of radial arm saws

      (a) Cantilever or carriage (Dewalt) - Saw under arm of carriage

      (b) Ram and cradle - Ram moves through the cradle

- (2) Nomenclature
  - (a) Column
    - 1 Supports the arm
    - 2 Elevation moves the column up to 1/6" to 1/8 with each turn
    - 3 Column locking handle locks the column in desired height
  - (b) Arm
    - 1 Supported by the column
    - 2 Has miter box scale, with a quick set for 90° and 45°
    - 3 Equipped with an arm locking clamp
  - (c) Yoke
    - 1 Under the arm in a swivel latch assembly
      - a Quick set for 0, 90 and 180 degrees
      - b Pin and lever
    - 2 Swivel clamp
    - 3 Rip lock to hold the saw while being used to rip material
    - 4 Bevel latch used to locate 0, 45 and 90 degrees
    - 5 Bevel dial plate to indicate the angle for the bevel
    - 6 Bevel clamp handle to hold motor at any angle

(d) Motor

1 Sizes range from 1 to 10 horsepower

2 Motor Arbor

a Shaft or arbor hold the blade or blades

b Left hand thread, with a nut and collar

(e) Guard

1 Adjustable

2 Blades must be completely covered on operator's side

3 Equipped with adjustable spout to let out the sawdust

4 Has an anti-kickback device to be used when ripping

(f) Table - the fence is used to measure the exact size of stock being cut out or ripped

(g) Blades and attachments

1 Cross cuts, rip and combination blades

2 Dado cutter head - Set of two blades and five chippers

3 Shaper with various cutting knives

4 This saw may also be used as a boring machine, router, and sanding machine

(3) Operation

(a) Cross cutting

1 Place arm at right angle to the guide fence

2 Set the miter latch column slot at the zero position

3 Lock arm with the arm clamp handle

4 Place the material on the work table with the crown against t[illegible]de fence

5 Make the cut and return the blade to position behind the guide fence

(b) Mitering

1 Position saw carriage as far back as it will go behind the guide fence

2 Release the arm clamp and miter latch

3 Swing the arm to the desired angle on the miter scale

4 Locate the arm latch in the proper column slot for the straight cut off or right or left 45°, miter cut if desired

5 For positions other than 45 or 90 degrees, lock the arm with the clamp handle and proceed with the cutting

(c) Ripping

1 The arm must be clamped in the cross cut position

2 Pull the motor carriage to the front of the arm and release the swivel clamp

3 Lift the rip latch

4 Revolve the miter yoke on the under side of the carriage

5 Locate the desired scale of position on the rip scale

6 Secure the swivel clamp and also the rip lock on the arm

7 Adjust the safety guard

8 Feed the material into the saw blade against the rotation of the blade (notice the rear of the guard; it will say - do not rip from this end)

(d) Bevel cut-off

1 Arm in cut-off position

2 Release column locking device

3 Raise column with crank

4 Release bevel clamp handle and bevel latch

5 Tilt motor in yoke (position motor for desired angle on dial scale)

6 Secure bevel latch and bevel clamp handle

7 Lower column for desired cut of blade

8 Tighten column locking lever

9 Proceed as in cross-cutting operation

(e) Compound Miter cut

1 Set up same as bevel operation

2 Release arm clamp handle and arm latch

3 Swing arm to desired position

4 Secure arm latch and clamp handle

5 Follow normal cross-cutting operation

(g) Dadoing

1 Remove saw blade

2 Mount dado head

3 To determine the depth of cut:

a Lower column until dado touches top of material

b Remove material

c Each complete turn of column handle lowers dado 1/8" to 1/16" d Use cross cut or miter procedure

(h) Grooving on flat surface (ploughing)

1 Place saw on rip position

2 Same procedure as in dadoing

3 Adjust safety guard so that in feed end almost touches material

4 Set kick back device

(4) Safety

(a) Keep saw blade set and sharp

(b) Allow saw to stop before changing set-up

(c) Do not rip or cut with rotation of power (warning sign on guard)

(d) Do not overload motor by forcing

(e) Adjust guard down to material for all operations

(f) Be sure all clamp handles are properly tightened before operating machines

APPLICATION:

Given a list of required construction material, select the material from the storage area and cut it to length, using the radial arm saw

PRESENTATION:

1.b. Set up and adjust the jointer and plane one edge of the material that was cut in the previous objective. Planed edge must be square with one surface.

- (1) Nomenclature
  - (a) Base casting
  - (b) Cutter head
  - (c) Knives
  - (d) Tables
    - 1 Infeed adjust to give size of cut or depth of cut
    - 2 Depth scale 1/8" in soft wood; 1/16" in hardwood
    - 3 Outfeed should not be adjusted
  - (e) Hand wheels
    - 1 Raising or lowering infeed table
    - 2 Raising or lowering outfeed table
  - (f) Fence
    - 1 Extends lengthwise and moves across jointer
    - 2 Tilts up to 45° either right or left
  - (g) Dual fence control handle - Holds fence at desired angle
  - (h) Tile scale - Angle of degree of fence

(i) Rabbeting ledge

1 Attached to outfeed table

2 Support for materials being rabbeted

(j) Guard - never operate with it removed

(k) Size of jointer - Length of cutter head

(2) Operation

(a) Edge planing

(b) End planing

(c) Face planning

(d) Squaring stock to dimension

(e) Tapering

(f) Rabbeting

(g) Beveling and chamfering

(3) Safety

NOTE: Instructor refer to Modern Woodworking Book, page 11-3

APPLICATION:

Set up and adjust the jointer and plane one edge of the material that was cut in the previous objective. Planed edge must be square with one surface.

PRESENTATION:

1.c. Set up and adjust the surface planer and surface plane the material that was cut and planed in previous objectives. Thickness of planed material must be in accordance with specifications.

(1) Nomenclature

- (a) Feed bed or tables - Width of bed determines size of planer
- (b) Depth indicator scale indicates thickness of material being planed
- (c) Depth adjustments - Large crank wheel for raising and lowering bed
- (d) Speed control - Controls number of linear feet per minute
- (e) Rollers - Motor driven
  - 1 Infeed rolls
  - 2 Delivery rolls
- (f) Chip breaker - Rides on top of board; bears down heavily to prevent grain from tearing up when knives in cutter head strike the board
- (g) Cutter head
  - 1 Revolves in opposite direction to which the board is moving
  - 2 Revolves at speed of 3,600 to 5,000 RPM
- (h) Knives - Cutter head may contain two or more knives according to its size
- (i) Pressure bar adjustment
  - 1 Solid bar; never made in sections

2 Bar rides on top of planed surface and holds board firmly against bed to prevent knives from digging into end board as it passes below cutter head

(2) Operation

(a) Planing to thickness

(b) Adjust the height of the bed; 1/16" less than stock thickness

(c) Turn on vacuum system - Switch located on south wall

(d) Turn on planer - Lay board on table and feed in machine

(3) Safety

NOTE: Instructors refer to Modern Woodworking Book, page 11-10

APPLICATION:

Set up and adjust the surface planer and surface plane the material that was cut and planed in previous objectives. Thickness of pained material must be in accordance with specifications.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

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CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

SG 3ABR55230-II-2. Reading assignment for Day 12.

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LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE CETC/1May74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER II	BLOCK TITLE Cabinet Construction

LESSON TITLE
Cabinet Framework, Sides and Top (Day 12)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 Hrs	0	6 Hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
17	1 May 1974	2

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Table Saw Jointer	None	None	SG II-2 WB II-2-P1 Textbook, Modern Woodworking

CRITERION OBJECTIVES AND TEACHING STEPS

2a. Using the table saw, rip the material which was cut and planed in the previous objectives to a specified width.

(1) Types of table saws

(2) Nomenclature

(3) Operation

(4) Safety

LESSON PLAN (Part I, General) CONTINUATION SHEET

CRITERION OBJECTIVES AND TEACHING STEPS (Continued)

2b. Using the jointer, plane the ripped edge of the material to a specifiedwidth.

(1) Jointer nomenclature

(2) Operation

(3) Safety

2c. Determine the material required for the sides and top of the cabinet; lay out this material and use the table saw to cut it to width. Comply with given specifications.

(1) Plywood

(2) Set table saw for ripping plywood

3ABR55230

Day 12, Unit 2

Branch Approved John Paulson

Date 11 MAY 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (345 Min)

PRESENTATION:

2.a. Using the table saw, rip the material which was cut and planed in the previous objectives to a specified width.

- (1) Types of table saws
  - (a) Variety table saw
    - (1) Tilting table - table tilts 0° to 45°

2 Fixed table - Motor and blade tilts 0° to 45°

(b) Universal table saw

1 Two arbors for rip and cross on blades

2 Generally a tilting table

(2) Nomenclature

(a) Table

1 Throat

2 Throat plates

a Rip, crosscut and miter

b Dado

c Sometimes necessary to use dado throat plates for beveling

3 Miter gauge guide slots

(b) Miter gauge (cutoff guage)

1 Swings from 0° to 60° in either direction

2 Stop rod - Multiple cutoff work

(c) Rip fence

1 Extends from front to rear of table

2 Quick acting cam - Micrometer adjustment

3 Locking lever will lock front and rear of fence

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4 Can be used on either side of blade

(d) Saw guard

- 1 Covers blade above table
- 2 Splitter - Can be part of guard or separate piece of metal
- 3 Kick-back dogs
  - a Metal plates with many teeth if attached to guard
  - b Sharp metal fingers

(e) Motor

- 1 10 hp to 1 hp
- 2 Arbor
  - a Blade generally mounted on motor
  - b Left hand thread
- 3 Collar - Dished
- 4 Brass nut - Soft metal to prevent injury to arbor threads
- 5 Raises and lowers for depth of cut
  - a Hand wheel for adjustment on front
  - b Locking knob in center of hand wheel
  - c Bevel indicator in front

(f) Control switch - Under front edge of table

- (g) Size - Diameter of blade

(3) Operation

- (a) Rip - Blade projects 1/8" above material
- (b) Cross cut - Blade projects 1/8" above material
- (c) Miter cut
- (d) Bevel crosscut
- (e) Compound miter
- (f) Dado
- (g) Grooving
- (h) Rabbeting
- (i) Tenoning
- (j) Allow 1/16" for each edge to be jointed

(4) Safety

NOTE: Instructor refer to Modern Woodworking Book, page 12-4

APPLICATION:

Using the table saw, rip the material which was cut and planed in the previous objectives to a specified width.

PRESENTATION:

2.b. Using the jointer, plane the ripped edge of the material to a specified width.

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(1) Jointer nomenclature

- (a) Base casting

(b) Cutter head -
revolves at speeds
from 3,600 to 6,000 RPM

(c) Knives - Cut should not
exceed 1/8" in soft
wood and 1/16" in hardwood

(d) Tables

  1 Infeed adjust to give
  size of cut or depth
  of cut

  2 Outfeed should not
  be adjusted

(e) Hand wheels

  1 Raising or lowering
  infeed table

  2 Raising or lowering
  outfeed table

(f) Fence

  1 Extends lengthwise
  and moves across
  jointer

  2 Tilts up to 45° either
  right or left

(g) Fence control handle -
Holds fence at desired
angle

(h) Tilt scale - Angle of
degrees of fence

(i) Pointer:

  1 Attached to infeed
  table

  2 Never trust the
  pointer; always check

(j) Rabbeting ledge

  1 Attached to outfeed
  table

2 Support for materials being rabbeted

(k) Guard - Will be in place

(l) Size of jointer - length cutterhead

(2) Operation

(a) Edge planing

(b) End planing - not recommended

(c) Face planing

(d) Squaring stock to dimension

(e) Tapering

(f) Rabbeting

(g) Beveling and chamfering

(3) Safety

NOTE: Instructor refer to Modern Woodworking Book, page 11-3

APPLICATION:

Using the jointer, plane the ripped edge of the material to a specified width.

PRESENTATION:

2.c. Determine the material required for the sides and top of the cabinet, lay out this material and use the table saw to cut it to width. Comply with given specifications.

(1) Plywood

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(a) Selecting plywood

(b) Determine size to be cut

(2) Set table saw for ripping plywood, use buddy system when ripping.

APPLICATION:

Determine the material required for the sides and top of the cabinet, lay out this material and use the table saw to cut it to width. Comply with given specifications.

(a) Student will complete Criterion Objectives Nr 2c, 2a, 2b.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

SG 3ABR55230-11-3, reading assignment for Day 13.

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LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE: TCETC 9Dec74

COURSE NUMBER: 3ABR55230

COURSE TITLE: Carpentry Specialist

BLOCK NUMBER: II

BLOCK TITLE: Cabinet Construction

LESSON TITLE: Joints (Day 13)

6 Hrs	0	6 Hrs
18	1 May 197	3
552X0		15 September 1972

CLASSROOM PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Drill Press Mortiser	None	None	SG II-3 WB II-3-P1 Textbook: Modern Woodworking

CRITERION OBJECTIVES AND TEACHING STEPS

3a. Set up the mortiser and mortise material for joint openings to specified dimensions. Joints must fit snugly without excessive play.

(1) Mortiser construction features

(2) Operating procedures

(3) Safety precautions

3b. Set up the drill press and drill holes for doweled joints as specified. Holes must be aligned so that the joined pieces will fit tightly.

(1) Drill press construction features

(2) Operating procedures

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(3) Safety

(4) Maintenance

(5) Types of dowels

Date ~~1 MAY~~ /32

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (345 Min)

PRESENTATION:

3.a. Set up the mortiser and mortise material for joint openings to specified dimensions. Joints must fit snugly without excessive play.

- (1) Mortiser construction features
  - (a) Frame
  - (b) Head assembly
    - 1 Motor
    - 2 Chuck
    - 3 Bit
    - 4 Chisel

(c) Foot treadle

(d) Spacing guage & clamp

(2) Operating procedures

(a) Place bit and hollow chisel into chuck

(b) Set bit to project 1/8" below hollow chisel

(c) Secure bit and chisel in place with set screw

(d) Secure wood stock in place

(e) Force bit and chisel into wood with foot treadle

(3) Safety Precautions

(a) Make sure all adjustments are correct

(b) Make sure all clamping devices are secured

(c) Keep hands clear of bit and chisel

APPLICATION:

Set up the mortiser and mortise material for joint openings to specified dimensions. Joints must fit snugly without excessive play.

PRESENTATION:

3.b. Set up the drill press and drill holes for doweled joints as specified. Holes must be aligned so that the joined pieces will fit tightly.

(1) Drill press construction features

(a) Polished steel column fastened to a cast iron base

(b) Table

(c) Head assembly

  1 Motor

  2 Feed lever

  3 Guard

  4 Depth scale

  5 Lock

  6 Chuck

  7 Depth stop

(d) Cone shaped pully

(2) Operating procedures

(a) Insert bit into chuck; tighten chuck with key

(b) Raise table desired height

(c) Adjust depth stop

(d) Clamp stock to table

(e) Force bit into material using feed lever

(3) Safety

(a) Clamp all stock to table

(b) Remove key from chuck

(c) Feed bit into stock slowly

(4) Maintenance

(a) Clean the machine daily

    (b) Check belt for wear and adjust

    (c) Replace worn bits or sharpen

    (d) Oil machine as needed

(5) Types of dowels

    (a) Hardwood

    (b) Steel pins

        1 Mark stock for holes accurately

        2 Use jig to drill holes

        3 Put glue into holes

        4 Insert dowel into hole of one piece of stock

        5 Align wood members and put dowel pin into other member drawing pieces tightly together

        6 Secure with clamps until glue is dry

APPLICATION:

Set up the drill press and drill holes for doweled joints as specified. Holes must be aligned so that the joined pieces will fit tightly.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

SG 3ABR55230-II-4. Reading assignment for day 14.

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LESSON PLAN (Part I, General)

APPROVAL TCETC 1May74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER II	BLOCK TITLE Cabinet Construction

LESSON TITLE
Trim Work (Day 14)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 Hrs	0	6 Hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
19	1 May 1974	4

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Band Saw Jigsaw Saber Saw Lathe	None	None	SG II-4 WB II-4-P1 Textbook: Modern Woodworking

CRITERION OBJECTIVES AND TEACHING STEPS

4a. Using the band saw, cut the notch for the toeboard in the cabinet sides to the specified dimensions.

(1) Band saw nomenclature

(2) Operation

(3) Safety

(4) Cleaning and maintenance

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LESSON PLAN (Part I, General) CONTINUATION SHEET

CRITERION OBJECTIVES AND TEACHING STEPS (Continued)

4b. Cut an inside curve in cabinet material, following a given pattern, using both the jigsaw and saber saw. Cut should not vary from the pattern more than 1/16".

(1) Jigsaw construction features

(2) Operating procedures

(3) Maintenance and cleaning

(4) Safety

(5) Saber saw construction features

(6) Operation

(7) Safety

(8) Cleaning and maintenance

4c. Using the lathe, turn stock for the door handles and drawer pulls to specified dimensions.

(1) Lathe construction features

(2) Turning tools

(3) Operation

(4) Safety

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (345 Min)

PRESENTATION:

4.a. Using the band saw, cut the notch for the toeboard in the cabinet sides to the specified dimensions.

(1) Band saw nomenclature

(a) Wheels

1 Determines the size of band saw

2 Can be moved up or down

3 Tracking balanced

4 Drive wheel (lower)

5 Usually made of cast iron

6 Rims are covered with rubber band or tires

a Protects teeth

b Cushions saw

c Prevents blade slipping

(b) Tables

1 Fastened to casting and above drive wheel

2 Slotted from one edge to center for saw blade

3 Throat plate (soft metal or wood)

4 Usually equipped with ripping fence

5 May be grooved for miter guage

6 Can be tilted right to angle of 45° to left 10°

7 Table made in two parts on large band saws

a Larger table to right through which blade runs can be tilted

b Smaller table to left is fixed

(c) Guides

1 Upper guides (movable)

a Two guide blocks or pins

b Thrust wheel or guide wheel

2 Lower guide (fixed)

a Two guide blocks or pins; small wheels b Thrust wheel or guide wheel

(d) Guide post

    1 Moves up or down

    2 Upper guide fastened to guide post

    3 Usually has spring counterbalance

(e) Guards

    1 Usually metal doors over idler and drive wheels

    2 Channel shaped steel guards for vertical portions of blade

        a Left guard is fixed

        b Right guard fastened to guide post

(f) Handwheels

    1 Raising and lowering upper wheel

    2 Tilting the tables

(g) Table lock - Locks table in position

(h) Scale and pointer - Shows exact degree of tilt

(i) Leveling stop pin- Table can quickly and accurately be returned to level position

(j) Blades

    1 ¼ to 1" in width

- 2 Thickness of blade averages about .001 inch thick for each inch of diameter of the wheels on which it is to run

- (k) Tilting screw
    - 1 For tracking the saw with idler wheel
    - 2 Located on front or back side of wheel
    - 3 Can be a hand wheel
- (l) Length of blade
    - 1 Circumference of one wheel
    - 2 Plus twice the distance between wheel centers

(2) Operation

- (a) Cross cutting
- (b) Ripping
- (c) Compound sawing - when materials are sawed on two or more sides (leg for chair or stool)
- (d) Cutting circles
- (e) Beveling
- (f) Jigs
- (g) Patterns

(3) Safety

    (a) Check adjustments of the band saw blade before turning on the power by moving the wheel by hand. This operation will allow you to check the guides and see if they are in proper position; also it enables you to check the saw tracking

    (b) Remove all tools or scraps of material from the table top before turning on the power

    (c) Clean the floor and remove debris from around equipment

    (d) Use only a saw that is sharp and properly set - Work forced against a dull blade may cause it to break; insufficient set causes the blade to bind and burn the material

    (e) Position and lock guide post about ¼" above the material to be cut

    (f) Avoid backing the saw blade out of the curved cuts or long straight ones; this has the tendency to pull the blade off the wheels

(4) Cleaning and maintenance

    (a) Keep interior and exterior clean daily

    (b) Check rubber tires or bands for cracks and loose spots

    (c) Replace worn out throat plates

(d) Examine belts for fraying if belt driven

APPLICATION:

Using the band saw, cut the notch for the toeboard in the cabinet sides to the specified dimensions.

PRESENTATION:

4.b. Cut an inside curve in cabinet material, following a given pattern, using both the jigsaw and saber saw. Cut should not vary from the pattern more than 1/16".

(1) Jigsaw construction features

(a) Base (frames)

(b) Table tilts 0° to 45°

(c) Driving mechanism (bottom)

(d) Tension mechanism (top)

(e) Guides

(f) Saw blade

(g) Motor

(2) Operating Procedures

(a) Set guides on top of material being cut

(b) If cutting interior cuts a hole should be bored in the material to start the cut

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(c) Blade must be properly aligned between upper and lower chucks

(3) Maintenance and cleaning

- (a) After blade has been installed be sure that the proper tension has been applied
- (b) Clean the jigsaw daily
- (c) Lubricate as needed
- (d) Major maintenance should be every 90 days

(4) Safety

- (a) Cut only light work on jigsaw
- (b) Jigsaw teeth must face downward
- (c) Place guides securely on top of work being cut
- (d) Instructor refer to Modern Woodworking Book, page 13-9 for further safety rules

(5) Saber saw construction features

- (a) OFF-ON switch
- (b) Pistol grip handle
- (c) Guide knob
- (d) Tilting base
- (e) Blade screw
- (f) Blade
- (g) Size blades
  - 1 6 to 12 teeth per inch
  - 2 10 teeth per inch for general use

(6) Operation

- (a) Straight or bevel cuts
- (b) Hold base firm on material
- (c) Select correct blade for your work

(7) Safety

- (a) Make certain tool is grounded
- (b) Disconnect the saw to change blades
- (c) Place base of saw on work before starting
- (d) Instructor refer to Modern Woodworking Book, page 13-13 for further safety rules

(8) Cleaning and maintenance

- (a) Clean saw daily
- (b) Keep blade sharp
- (c) Check cord (frayed or broken)

APPLICATION:

Cut an inside curve in cabinet material, following a given pattern, using both the jigsaw and saber saw. Cut should not vary from the pattern more than 1/16".

PRESENTATION:

4.c. Using the lathe, turn stock for the door handles and drawer pulls to specified dimensions.

(1) Lathe construction features

(a) Head stock

- 1 Motor
- 2 Spindle
- 3 Face plate
- 4 Live center

(b) Bed

(c) Tool rest (tool support)

(d) Tail stock

- 1 Spindle
- 2 Spindle lock
- 3 Hand wheel
- 4 Tail stock locking clamp
- 5 Dead Center

(e) Switch

(f) Drive pulley

(2) Turning tools

(a) Gouge

- 1 Roughing out
- 2 Cove cuts

(b) Skew

- 1 Smooth cylinders
- 2 Cut shoulders and beads

(c) Parting tool

- 1 Cutting off
- 2 Sizing cuts

- (d) Spear point
- (e) Round nose
- (f) Square nose

(3) Operation (turning)

- (a) Turning speeds
  - 1 Rough out speed 600 to 1000 RPM
  - 2 Round and true stock 1,500 to 2,000 RPM
- (b) Locate centers of stock and draw diagonal lines across the corners
- (c) Use a handsaw or bandsaw and cut into diagonal lines about 1/8" deep
- (d) Using a mallet mount stock on live center (hardwood only)
- (e) Slide the tail stock into position so that the point of the dead center is about 1/4" from material
- (f) Lock the tail stock to the bed
- (g) Turn the handwheel so that the dead center will be forced into wood
- (h) Adjust the tool rest so that it is 1/8" above the center line and clears the work by 1/4"

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(i) Lock the tool rest in this position

(4) Safety

NOTE: Instructor refer to Modern Woodworking Book, page 15-4

APPLICATION:

Using the lathe, turn stock for the door handles and drawer pulls to specified dimensions.

NOTE: Students will complete Criterion Objectives Nr 4c, 4b, and 4a

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

SG 3ABR55230-II-5. Reading assignment for Day 15.

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LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE CETC/1May74	INSTRUCTOR
OURSE NUMBER ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER II	BLOCK TITLE Cabinet Construction

LESSON TITLE
Curved Edge Sanding (Day 15)

LESSON DURATION

LASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 Hrs	0	6 Hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
21	1 May 1974	5

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
arpentry Handtools Disc-Belt Sander Wood Clamps			SG II-5 WB II-5-P1 Textbook: Modern Woodworking

CRITERION OBJECTIVES AND TEACHING STEPS

5a. Sand material to specifications, using the disc-belt sander. Sanded edges must be smooth.

- (1) Construction features
- (2) Operating procedures
- (3) Maintenance
- (4) Safety

5b. Assemble the cabinet, using the parts that were constructed in previous lessons. All joints must be tight and the corners must be square.

- (1) Assembly procedures
- (2) Checking joints
- (3) Glue procedures
- (4) Use of clamps

3ABR55230 Branch Approved John Paulson

Day 15, Unit 5 Date 1 MAY 1974

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PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (345 Min)

PRESENTATION:

5.a. Sand material to specifications, using the disc-belt sander. Sanded edges must be smooth.

- (1) Construction features
  - (a) Table
  - (b) Circular metal plate (disc)
  - (c) Miter guage slot
  - (d) Sand on abrasive paper (designated by grit numbers)
    - 1 100 grit (finest belt sander)
    - 2 30 grit (coursest belt sander)

(2) Operating procedures

- (a) Use side of disc that revolves downward past table
- (b) Move work along face of disc to avoid burning the wood and ruining the sandpaper
- (c) Belt sander - Sand material by holding wood against top of table and on face of sanding belt

(3) Maintenance

- (a) Replace worn belts on the machine
- (b) Use a non-drying adhesive when applying new sanding disc
- (c) Oil the sander when needed
- (d) Clean the machine daily

(4) Safety

- (a) Remove all jewelry
- (b) Eye protection will be worn
- (c) Do not wear loose clothing
- (d) Replace worn out sanding discs and belts

5.b. Assemble the cabinet, using the parts that were constructed in previous lessons. All joints must be tight and the corners must be square.

(1) Assembly procedures

(a) Follow details on pages 18-22 and 18-23 in Modern Woodworking

(b) Use glue to assemble cabinet and use bar clamps while glue is drying

(c) Use a square during the gluing and clamping operation to square all corners

(2) Checking joints

(a) Joints should be checked for squareness before tightening clamps

(b) Use a tri-square or combination square for joint checking

(3) Glue procedures

(a) Use only enough glue to cover the surface of the parts to be joined

(b) Always wipe excess glue away immediately after final tightening of clamps. Use a slightly damp cloth

(4) Use of clamps

(a) Hand screw clamps

1 Tightening end spindle provides greatest pressure

2 Available in sizes from 4 to 24 inches

(b) Bar clamps

1 Use 3 clamps on wide surfaces - 2 on one side, 3rd center on opposite side

2 Available in lengths from 2 to 8 ft

APPLICATION:

Sand material to specifications, using the disc-belt sander. Sanded edges must be smooth.

Assemble the cabinet, using the parts that were constructed in previous lessons. All joints must be tight and the corners must be square.

EVALUATION:

1. Observe student's performance during the lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

SG 3ABR55230-II-6. Read unit 16 on the router and shaper and unit 17 on the portable belt sander in Modern Woodworking.

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LESSON PLAN (Part I, General)

PPROVAL OFFICE AND DATE CCETC/ 1May74	INSTRUCTOR
OURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
OCK NUMBER 1	BLOCK TITLE Cabinet Construction

ESSON TITLE
Surface Sanding and Decorative Shaping (Day 16)

LESSON DURATION

LASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 Hrs	0	6 Hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
22	1 May 1974	6

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Shaper Router Portable Sander	None	None	SG II-6 WB II-6-P1 Textbook: Modern Woodworking

CRITERION OBJECTIVES AND TEACHING STEPS

6a. Using the shaper, form the lipped edges on the cabinet door and drawer front material. Formed edges must be smooth and uniform.

(1) Construction features

(2) Operation procedures

(3) Maintenance

(4) Safety

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6b. Cut decorative inlays in cabinet according to specifications, using the router.

(1) Construction

(2) Operating procedures

(3) Maintenance

(4) Safety

6c. Sand completed portions of the cabinet to prescribed standards. Sanded portions must be smooth.

(1) Construction features

(2) Operation

(3) Maintenance

(4) Safety

3ABR55230 Branch Approved John Paulson

Day 16, Unit 6 Date 1 MAY 1974

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PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (345 Min)

PRESENTATION:

6.a. Using the shaper, form the lipped edges on the cabinet door and drawer front material. Formed edges must be smooth and uniform

(1) Construction features

(a) Base

(b) Switch

(c) Elevating lever

(d) Table

1 Blade opening

2 Table groove for sliding jig attachments

(e) Fence

(f) Spindle

(g) Fence locking clamps

(h) Table inserts

(i) Cutter heads

1 Blade opening

2 Assembled type

(2) Operation procedures

(a) After making sure that the machine is unplugged, select the type cutter head to be used in the shaping operation. Once installed, adjust the cutter head to the depth of cut to be made

(b) Align the fence. It is best to use a steel straight edge. Lock the fence into place, using the fence locking clamps

(c) Material to be shaped must rest flat on the machine table and firmly against the fence or steel guide post

(d) Feed the material at an even pace when cutting to avoid tearing the grain. If fed too slowly, the wood will burn or turn a dark color

(3) Maintenance

- (a) After cutting a large amount of material, use a wire brush to clean and oil the cutter heads
- (b) Check and fill the oil spindle cup before and after using the shaper if needed
- (c) Clean the machine daily
- (d) Oil the machine table top to prevent rusting. If needed, use steel wool to clean it after operating

(4) Safety

- (a) Remove all jewelry
- (b) Eye protection will be worn during the entire cutting procedure
- (c) Material used when shaping must be at least 12 inches in length
- (d) Do not wear loose clothing
- (e) Keep your hands and body clear of the cutter

APPLICATION:

Using the shaper, form the lipped edges on the cabinet door and drawer front material. Formed edges must be smooth and uniform.

PRESENTATION:

6.b. Cut decorative inlays in cabinet according to specifications, using the router.

(1) Construction

- (a) Switch
- (b) Micrometer depth adjustment
- (c) Collect chuck (¼" and 3/8")
- (d) Hand grip
- (e) Locking lever (sub-base)
- (f) Sub-base
- (g) Cutters (bits)

(2) Operating procedures

- (a) Select bits to be used
- (b) Adjust the router for depth of cut to be made
- (c) Lock the sub-base securely
- (d) Hold the router with both hands while cutting

(3) Maintenance: Follow the operator's manual

(4) Safety

- (a) Wear eye protection
- (b) Work should be secured
- (c) Ground the machine
- (d) Make sure the machine has stopped before the work is set down
- (e) Disconnect the router before changing bits

- (f) Before turning on power, make sure the bit is away from the work
- (g) Make sure the bit is tight in the chuck

APPLICATION:

Cut decorative inlays in cabinet according to specifications, using the router.

PRESENTATION:

6.c. Sand completed portions of the cabinet to prescribed standards. Sanded portions must be smooth.

- (1) Construction features
  - (a) Switch
  - (b) D-handle
  - (c) Front handle
  - (d) Dust bag
  - (e) Belt tracking knob
  - (f) Belts
    - 1 For a smooth finish, use a fine belt
    - 2 For a semi-finish, use a belt of medium grit size.
    - 3 For a rough finish, use a coarse grit sanding belt
- (2) Operation
  - (a) Turn on the sander and track the belt
  - (b) Hold the sander with both hands

- (c) Move the sander forwards and backwards over work surface
- (d) Follow the operator's manual to make minor repairs on the sander

(3) Maintenance - Use manufacturer's manual

- (a) Keep sander clean
- (b) Change belts as necessary

(4) Safety

- (a) Wear eye protection
- (b) Make sure the tool is grounded
- (c) Keep your hands away from the belt while running
- (d) Disconnect the machine to change belts
- (e) Make sure the sander has stopped before setting it down
- (f) Always hold the sander with both hands when in use
- (g) Remove all jewelry

APPLICATION:

Sand completed portions of the cabinet to prescribed standards. Sanded portions must be smooth.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.

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3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

SG 3ABR55230-II-7. Read unit 17, on portable finishing sanders.

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE TCFTC 9 Dec 74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER II	BLOCK TITLE Cabinet Construction

LESSON TITLE
Edge Finishing (Day 17)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 Hrs	0	6 Hrs

PO REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
23	[illegible]	7

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Vibrator Sanders Carpentry Hand Tools			SG II-7 WB II-7-P1 Textbook: Modern Woodworking

CRITERION OBJECTIVES AND TEACHING STEPS

7. Smooth and finish sanding cabinet edges. Sanded surfaces must be smooth and free of scratches.

   a. Vibrating sander

      (1) Components
      (2) Principles of operation
      (3) Cleaning and lubrication
      (4) Safety

   b. Finishing of cabinets

      (1) Steps in finishing cabinets
      (2) Pre-operation inspection of finishing sander

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3ABR55230 Branch Approved John Paulson

Day 17, Unit 7 Date 1 MAY 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (345 Min)

PRESENTATION:

7. Smooth and finish sanding cabinet edges. Sanded surfaces must be smooth and free of scratches.

   a. Vibrating sander

      (1) Components

         (a) Contoured handle

         (b) Insulated trigger switch

         (c) Cord strain reliever

         (d) Front hand knob

         (e) Metal housing

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- (f) Paper clamps (two types)
    - 1 Spring loaded
    - 2 Friction type
- (g) Pads
    - 1 Felt
    - 2 Rubber

(2) Principles of operation

- (a) Select abrasive sandpaper
- (b) Install abrasive papers tightly over the pad surface
- (c) Secure work
- (d) Start the sander while it is off the work
- (e) Move the sander back and forth with the grain
- (f) Use one or both hands to guide the sander
- (g) Avoid applying extra weight when using the sander
- (h) Use the sander to remove small amounts of material during finishing work

(3) Cleaning and lubrication

- (a) Clean the sander thoroughly before putting it away

(b) Study the operator's manual for instructions on lubrication and adjustments

(4) Safety

(a) Wear eye protection

(b) When working in an enclosed area, wear a respirator

(c) Keep hands away from moving parts while using the sander

(d) Check the sander and make sure it is grounded

(e) Make sure the machine has stopped before setting it down

b. Finishing of cabinets

(1) Steps in finishing cabinets (mirror finish)

(a) Sand with course sandpaper

(b) Wet lightly with wet sponge and let dry

(c) Use medium sandpaper

(d) Wet with sponge and let dry

(e) Sand with fine sandpaper

(f) Wet with sponge and let dry

(g) Use medium steel wool

(h) Wet with sponge and let dry

(i) Use fine steel wool

NOTE: Go through as many steps as you want to get the desired finish

(j) Edges will be sanded first and not over-sanded or it will round out the corners

(2) Pre-operation inspection of finishing sander

(a) Install proper grit sandpaper for the job

(b) Make sure sandpaper is secured

(c) Material to be sanded will be secured

(d) Sander should be grounded

APPLICATION:

Smooth and finish sanding cabinet edges. Sanded surfaces must be smooth and free of scratches.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

SG 3ABR55230-II-8. Stop lesson and assign reading material - Pages 18-13 through 18-19 on swinging doors and hardware and metal trim.

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LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE TCFTC/9Dec74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER II	BLOCK TITLE Cabinet Construction

LESSON TITLE
Cabinet Assembly and Finishing (Days 18 thru 20)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
16 Hrs	0	16 Hrs

HQ REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
24	1 May 19[illegible]	8

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Carpentry Hand Tools, Portable Finishing Equipment			SG II-8 WB II-8-P1 Textbook, Modern Woodworking

CRITERION OBJECTIVES AND TEACHING STEPS

8a. Complete cabinet construction, using sanders and wood clamps. The cabinet must be square and all joints tight.

(1) Types of wood clamps
(2) Uses of wood clamps
(3) Maintenance on clamps
(4) Sanding cabinet (finishing)

8b. Install cabinet knobs and hinges. Use methods that conform to good carpentry practices as explained in textbook, Modern Woodworking.

(1) Methods of installing cabinet pulls
(2) Methods of installing cabinet hinges
(3) Checking completed work

ATC FORM AUG 72 770

3ABR55230 Branch Approval John Paulson

Days 18 through 20, Unit 8 Date : 1 MAY 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (945 Min)

PRESENTATION:

8.a. Complete cabinet construction, using sanders and wood clamps. The cabinet must be square and all joints tight.

- (1) Types of wood clamps
    - (a) Hand screw
    - (b) C Clamps
    - (c) Bar Clamps
- (2) Uses of wood clamps
    - (a) Used in gluing long pieces of material
    - (b) Used when applying metal fasteners

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(3) Maintenance on clamps

  (a) Cleaning

  (b) Applying light coat of oil

(4) Sanding cabinet (finishing)

8.b. Install cabinet knobs and hinges. Use methods that conform to good carpentry practices as explained in textbook, Modern Woodworking.

(1) Methods of installing cabinet pulls

  (a) Drawer pulls look best when installed slightly above center line and level

  (b) Can be installed according to individual preference

  (c) If you have many pulls to install you can save time by making a jig

  (d) Should be installed and pre-fitted and removed for finishing

(2) Methods of installing cabinet hinges

  (a) Refer to page 18-13 for hinge installation

  (b) Types of hinges

    1 Butt hinges (used for flush doors)

    2 Semi-concealed

    3 Decorative surface

    4 Utility surface

(c) Select a hinge that will be appropriate for the size of the door

(d) Size of hinge is determined by its length and width when open

(3) Checking completed work

(a) Insure that doors and drawers do not bind

(b) Make necessary adjustments if necessary

APPLICATION:

Complete cabinet construction, using sanders and wood clamps. The cabinet must be square and all joints tight.

CONCLUSION (Day 18)

SUMMARY:

ASSIGNMENT:

Review pages 18-13 to 18-19 in textbook, Modern Woodworking.

INTRODUCTION (Day 19)

MOTIVATION:

REVIEW:

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OVERVIEW:

APPLICATION (cont)

Complete cabinet construction, using sanders and wood clamps. The cabinet must be square and all joints tight.

Install cabinet knobs and hinges. Use methods that conform to good carpentry practices as explained in textbook, Modern Woodworking.

CONCLUSION (Day 19)

SUMMARY:

ASSIGNMENT:

Review all material covered in this block.

INTRODUCTION (Day 20)

MOTIVATION:

REVIEW:

OVERVIEW:

APPLICATION (cont)

Install cabinet knobs and hinges. Use methods that conform to good carpentry practices as explained in textbook, Modern Woodworking.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE TCETC/1May74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER III	BLOCK TITLE Building Construction

LESSON TITLE
Foundations and Form Construction (Day 21)

LESSON DURATION

CLASSROOM/LABORATORY 6 Hrs	COMPLEMENTARY 0	TOTAL 6 Hrs

POI REFERENCE

PAGE NUMBER 36	PAGE DATE Changed 1 May 1974	PARAGRAPH 1

STS/CTS REFERENCE

NUMBER 552X0	DATE 15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Carpentry Hand Tools Portable Power Tools Multiuse Low Wall Forms	None	None	SG III-1 WB III-1-P1 Film: MN6719a

CRITERION OBJECTIVES AND TEACHING STEPS

1a. Given a drawing of footings, foundations, and forms of various types, identify each of the items illustrated.

(1) Types and purposes of foundations
(2) Materials used for foundations
(3) Protection
(4) Layout building lines
(5) Types of forms

1b. Working as a member of a team, measure and cut material, and construct a slab form. The constructed form must be square and level.

(1) Square all corners
(2) Level all sides
(3) Safety to personnel during installation

3ABR55230 Branch Approved Robert F. Fenner

Day 21, Unit 1 Date 1 MAY 1974

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PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (345 Min)

PRESENTATION:

1.a. Given a drawing of footings, foundations, and forms of various types, identify each of the items illustrated.

   (1) Types and purposes of foundations

      (a) Definition: Foundations are the lowest part of a structure on which the sills and other members of the super-structure rest

      (b) Purpose: To prevent soil contract, keeps wood members of floors and walls from coming in contact with the moisture of the soil and therefore prevents rotting and termites

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- (c) Guards against the action of frost that causes the surface of the ground to rise and fall slightly causing the building to move
- (d) Acts as a retaining wall where a basement is involved

(2) Materials used for foundations

- (a) Concrete
  - 1 Permanent
  - 2 Probably the most common type
- (b) Brick or stone
  - 1 Permanent
  - 2 Water problems may exist with this
  - 3 Time consuming to build
- (c) Concrete block
  - 1 Permanent
  - 2 Compares favorably to brick or stone
- (d) Hollow tile
  - 1 Permanent
  - 2 Used for very light structures
- (e) Rubble masonry
  - 1 Permanent
  - 2 Permits a potential water problem

- (f) Pier and post
  - 1 Permanent if concrete
  - 2 Temporary if wood
- (g) Mud sill
  - 1 Temporary
  - 2 Timbers are placed directly on ground
- (h) Piling
  - 1 Permanent or semi-permanent
  - 2 Dependent upon type of material used

(e) Protection

- (a) Water and damp proofing
  - 1 Install drain pipes around the foundation
  - 2 Application of alternate layers of felt and hot pitch on exterior of foundation wall
  - 3 Cement plaster on exterior of masonry walls
- (b) Termite protection
  - 1 Metal shield
  - 2 Chemical soil barriers
    - a Termite protection
    - b Heptachlor 0.5%
    - c Chlordane 1.0%

            - d Dieldrin 0.5%
            - e Benzene hexachloride 0.8%
            - f Aldrin 0.5%
        - (c) Ventilation methods
            - 1 Minimum of 18" clearance between ground and lowest wood member
            - 2 Foundation vents
    - (4) Layout building lines
        - (a) Batter boards
        - (b) 6 - 8 - 10 method
        - (c) Form layout
    - (5) Types of forms
        - (a) Footing forms
        - (b) Bare earth forms
        - (c) Wooden forms
        - (d) Key way
        - (e) Wall forms
            - 1 Whalers
            - 2 Triangular bracing
        - (f) Slab forms
            - 1 Concrete placed directly on ground
            - 2 Sidewalks and driveways
        - (g) Prefabricated forms-Forms that are constructed in shop

1.b. Working as a member of a team, measure and cut material, and construct a form for a slab form. Constructed form must be square and level.

(1) Square all corners

(2) Level all sides

(3) Safety to personnel during installation

(a) Driving stakes with sledge hammer

(b) Overstriking the stake and hitting stake with handle

APPLICATION:

Given a drawing of footings, foundations, and forms of various types, identify each of the items illustrated.

Working as a member of a team, measure and cut material, and construct a form for a slab form. Constructed form must be square and level.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

SG 3ABR55230-III-1 through 6 .
Read Light Frame Construction.
Read unit 7, Floor Framing, and Unit 8, Wall and Ceiling Framing, page 111 through 155. After reading the assignment, use a separate sheet of paper and answer questions 1 through 12 on page 134 and 1 through 12 on page 155. Complete student handout by writing the name of the building components on the arrow pointing to the component.

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LESSON PLAN (P   t I, General)

APPROVAL OFFICE AND DATE CETC/ 4Sep74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Sp cialist
BLOCK NUMBER III	BLOCK TITLE Building Cons ruction

LESSON TITLE
Light Frame Construction (Days 22 thru 25)

LESSON DURATION

CLASSROOM/LABORATORY 21 Hrs	COMPLEMENTARY 2 Hrs	TOTAL 23 Hrs

POI REFERENCE

PAGE NUMBER 27	PAGE DATE Changed 26 Au ust 1974	PARAGRAPH 2

STS/CTS REFERENCE

NUMBER 552X0	DATE 15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Carpentry Hand Tools Portable Power Tools Building Mock-up Framed Building	None	None	SG III-2 WB III-2-P1 Textbook: Modern Carpentry Film: MN 6719B

CRITERION OBJECTIVES AND TEACHING STEPS

2a. Given a drawing of the framework of a l ght frame building, locate and identify the major components.

(1) Types of frames
(2) Sills and girders
(3) Joists
(4) Bridging
(5) Subfloors

2b. Given a framing plan of a wall, locate a d identify the major construction features.

(1) Wall pla es
(2) Wall framing members

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2c. Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section for a wood frame structure. Completed structure will have a framed opening for a door and must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.

(1) Portable power saw
(2) Spacing and layout
(3) Cut studs to length
(4) Install trimmer studs, headers and cripple studs

2d. Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section containing a framed opening for a window for a wood frame structure. Completed work must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.

(1) Layout
(2) Installation

File 185
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3ABR55230 Branch Approved Robert F Freeman

Days 22 through 25, Unit 2 Date 1 MAY 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (1245 Min)

PRESENTATION:

2.a. Given a drawing of the framework of a light frame building, locate and identify the major components.

- (1) Types of frames
  - (a) Balloon frame
    - 1 Studding runs from sill to top plate
    - 2 Second story floor joists are carried by a ribbon let into the studs

(b) Platform frame (western)

1 Fast and simple to erect

2 Side walls start above the subfloor

3 Provides safe working conditions

4 Gives natural fire stop at each floor level

(2) Sills and girders

(a) Girders

1 A large beam supporting other beams or joists

2 Types of girders

a Build up or laminated wood

b Solid (heartwood)

c Steel (I or H beams)

d Concrete

(b) Sills

1 Provides a means of typing the framework to the foundation

2 Types of sills

a Type of sill being used

b Foundation under sill

c Type of building being supported

3 Materials

a Redwood

b Cedar

c Cypress

d Creosote treated materials

4 Layout procedures

a Material should be as long as possible with no joints where there is an opening in the foundation wall

b Joints held to a minimum

c Insure that all joints are square

d Sill is secured to a masonry foundation with anchor bolts

(3) Joists

(a) Definition and purpose

1 Floor joists are timbers that support the load of the rooms they span

2 The joists under any particular room of a house serves to carry both live and dead load

(b) Types of joists

1 Common

2 Trimmer

3 Cripple

4 Carrying joist

(c) Spacing

1 16" on center most common

2 Can be 12", 16", 20" or 24" on center

(d) Installation methods

1 Square all ends

2 Turn crown of stock up

3 Bearing surface should not be less than 4"

4 Nailing to header with 2 - 20d common nails

(4) Bridging

(a) Definition and purpose

1 Bridging is a brace or series of braces used between joists to stiffen them and distribute the weight

2 Bridging prevents vibrations or squeaking of joists

(b) Types and sizes

1 Solid bridging must be made of the same size material as the floor joist. Cut to fit snugly between the joist.

2 Cross or herringbone is usually 1 x 3, 1 x 4 or 2 x 3

3 Steel bridging requires no nails

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(c) Spacing

1 Solid - placed as floor joists are installed

2 Placed in rows 5 to 8 feet apart

(5) Subfloors

- (a) Purpose: Material laid directly on the joist to strengthen the floor assembly
- (b) Serves as a base for finish floor
- (c) Materials
  - 1 Plywood - Minimum ½" thick with joist 16" O.C.
  - 2 S4S
  - 3 Fiberboard
  - 4 Ship lab
  - 5 Tongued and grooved
- (d) Installation methods
  - 1 Layed at right angles to the joist
    - a Most economical
    - b Finish floor must be layed parallel to the joist
  - 2 Layed diagonal to the joist
    - a Least economical
    - b Allows finish floor to be layed in any direction

c Gives better bracing action

2.b. Given the framing plan of a wall, locate and identify the major construction features.

(1) Wall plates

(a) Sole plate - The bottom plate in a wall

(b) Top plate - The top plate is nailed to the top

(c) Double top plate - Interlocks all corners to help straighten the walls and provides added strength to carry the ceiling joist and rafters

(d) Layout of plates

1 Corresponding sole and top plates should be layed out in pairs (at the same time) to insure a greater degree of accuracy and stud plumbness

2 Layout can be for 12", 16", or 24" on center stud spacing (16" being most common)

3 To lay out sole and top plates for stud placement 16" O.C. outside layout, measure in 15-1/4" from the outside corner of the building. Square a line across the plate at this point. This will give you the position of the side nearest the corner for the first stud and will place the center of that stud, which is 1-1/2" thick, at 16" from the outside building corner

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4 From this first mark, continue your layout making marks 16" until the ends of the plates have been reached

5 Begin the layout of both side walls from the same end of the building. Use of the same procedure for the end walls

(2) Wall framing members

(a) Studs

1 Definition - Studs are the vertical members in the walls and partitions

2 Types

a Common - Runs vertically from the top plate to the sole plate

b Trimmer - Runs vertically inside all window and door openings

c Cripple - Runs vertically above door and window openings and also below window openings

d Corner post - Solid or built up members that support both inside and outside corners of the building. Minimum of 3 filler blocks, approximately 18" long.

e T-Post - Members that form the ends of partitions, walls, and provide nailing surface for inside wall finishes

3 Length - to find the length of studs, deduct the thickness of the sole plate and the double top plate from the overall height of the wall (deduct thickness of sheetrock). This will give ceiling height from subfloor to ceiling joist

(b) Header

1 Definition - Any horizontal member that crosses any other vertical member of the frame at a 90° angle and has no other specific name

2 Materials

a Solid - Usually a 4 x 4, 4 x 6, or 4 x 8, but may be larger depending on the width of the opening

b Laminated - Built up from two or more pieces of lighter material nailed together

3 Types

a Door - The horizontal member that rough frames the top of the opening and is supported by a trimmer stud at each end b Window - The horizontal member that rough frames the top of the opening and is supported by a trimmer stud at each end

4 Layout

a Door header - Height from sub-floor to bottom of the header. Add thickness of finish floor and thickness of threshold + door height + thickness of top jamb + ½" framing allowance

b Window header from rough sill to header. Add SASH + 4"

c Framing allowance - The dimensions for "rough" openings for doors and windows must be calculated and then layed out on the plates according to specifications, usually from a center line

1 Doors - Add door width plus twice the thickness of the jamb material plus ½" framing allowance on each side (to allow for plumbing of the jambs); equals total distance between trimmer studs

2 Windows - Layed out similar to door openings

(c) Braces - (Definition) Braces are members that support the frame against the wind

1 Types of braces

a Let-in-diagonal brace (studs notched to receive continuous piece of 1 x 4 stock to stiffen wall framing)

b Cut-in-diagonal brace (made of the same size material as the studs and cut to fit between the studs)

c Plywood (in some cases plywood provides sufficient rigidity)

2 Installation methods

a All wind braces should be placed as near 45° as possible but may range from 40° to 60°

b The top should be toward the prevailing wind

c Kicker blocks should be installed at the top and bottom of cut in braces

(d) Fire blocking and backing - Fire blocking and backing are horizontal members in the side that check a draft between studs and serve as a naillling block for other material. It may also serve as hangers for fixtures

1 Straight-line blocking is used when it is to serve as backing

2 Staggered is used when it is not to be used for backing

APPLICATION:

Given a drawing of the framework of a light frame building, locate and identify the major components.

Given a framing plan of a wall, locate and identify the major construction features.

EVALUATION:

1. Observe students performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (Day 22)

SUMMARY:

ASSIGNMENT:

SG 3ABR55230-III-1 through 6. As a member of a team, you will disassemble a rough frame building and reconstruct a light frame building. For study reference review the text book material of Day 22.

INTRODUCTION (Day 23)

MOTIVATION:

REVIEW:

OVERVIEW:

PRESENTATION:

2.c. Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section for a wood frame structure. Completed structure will have a framed opening for a door and must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.

(1) Portable power saw

(a) Check saw and blade for condition

(b) Proper use of saw

(c) Changing blade

(d) Safety in using saw

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1 Hold with both hands

2 Keep cord clear

(2) Spacing and layout

(a) Lay out sole plates using dimensions given by instructor

(3) Cut studs to length

(a) Assemble corner studs using prescribed method

(b) Nail sole plate and top plate to studs

(4) Install trimmer studs, headers and cripple studs

(a) Rough door openings

2.d. Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section containing a framed opening for a window for a wood frame structure. Completed work must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.

(1) Layout

(a) Sole plates using dimensions given by instructor

(2) Installation

(a) Install trimmer studs, headers, and cripple studs for rough window openings

APPLICATION:

Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section for a wood frame structure. Completed structure will have a framed opening for a door and must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.

Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section containing a framed opening for a window for a wood frame structure. Completed work must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (Day 23)

SUMMARY:

ASSIGNMENT:

As a member of a team, you will construct a light frame building. For study reference, review the textbook material of Day 22.

INTRODUCTION (Day 24)

MOTIVATION:

REVIEW:

OVERVIEW:

CHECK HOME STUDY ASSIGNMENT:

APPLICATION (cont)

Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section for a wood frame structure. Completed structure will have a framed opening for a door and must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.

Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section containing a framed opening for a window for a wood frame structure. Completed work must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (Day 24)

SUMMARY:

ASSIGNMENT:

SG 3ABR55230-III-1 through 6. As a member of a team, you will be required to erect a single pole scaffold. The reading assignment for Day 25 includes Unit 22, pages 445 through 450 in the text. Use a separate sheet of paper to answer questions 1 through 7 on page 450.

INTRODUCTION (Day 25) (FIRST HALF)

MOTIVATION:

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REVIEW:

OVERVIEW:

CHECK HOME STUDY ASSIGNMENT:

APPLICATION:

Working as a member of a team and using a portable power saw and carpentry hand tools, lay out, cut and construct a wall section containing a framed opening for a window for a wood frame structure. Completed work must be plumb and square. Size of framed opening must be within 1/16" of given dimensions.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

SG 3ABR55230-III-1 through 6. As a member of a team, you will be required to erect a single pole scaffold. The reading assignment for Day 25 includes Unit 22, pages 445 through 450 in the text. Use a separate sheet of paper to answer questions 1 through 7 on page 450.

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE CETC/1May 74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER III	BLOCK TITLE Building Construction

LESSON TITLE
Scaffold Construction (Days 25 and 26)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 Hrs	2 Hrs	8 Hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
29	1 May 1974	3

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Framed Building Portable Power Hand Tools Carpentry Hand Tools	None	None	SG III-3 WB III-3-P1 Textbook: Modern Carpentry

CRITERION OBJECTIVES AND TEACHING STEPS

3. As a member of a team, erect a single-pole scaffold to a specified working height. Scaffold must conform to safety standards and construction practices outlined in the textbook, Modern Carpentry.

a. Definition
b. Types of scaffolds
c. Nomenclature and functions
d. Safety

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3ABR55230 Branch Approved Robert [illegible]

Days 25 and 26, Unit 3 Date 1 MAY 1974

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PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (345 Min)

PRESENTATION:

3. As a member of a team, erect a single-pole scaffold to a specified working height. Scaffold must conform to safety standards and construction practices outlined in the text book, Modern Carpentry.

   a. Definition - A temporary platform for supporting workmen, tools, and material during the course of work

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b. Types of scaffolds

(1) Staging bracket (carpenter's bracket) - a plank platform supported on triangular braced bracket secured to the side of the building wall.

(2) Single pole scaffold - A platform resting on ledger (putlog) the outer ends of which are supported on ribbons secured to a single row of poles or up-rights and the inner ends supported by the building or wall

(3) Double pole scaffold (independent)

  (a) A platform supported from the base by a double row of poles or uprights, independent of support from the walls and constructed of uprights, ledgers, ribbons, and diagonal bracing. An independent or double pole scaffold may be referred to as a built-up scaffold

  (b) Maximum height should be limited to 18 ft

c. Nomenclature and functions

(1) Footing (optional)

  (a) Minimum 2" thick material

  (b) Not required if scaffold poles rest

on concrete or other suitable stable material

(2) Pole or upright

- (a) 2" x 4" minimum
- (b) Should be free of major defects such as large knots or knothole
- (c) Should be plumb

(3) Ledger (putlog)

- (a) The scaffold member which supports the platform
- (b) Minimum of 2" x 6" material

(4) Ribbon

- (a) Extend horizontally from pole to pole at right angles to the ledger
- (b) Minimum 2" x 4" material
- (c) Should span at least 2 pole spaces (3 poles)

(5) Bracing

- (a) A diagonal tie that holds one point in a fixed position with respect to another. They are secured to the outer side of the poles
- (b) Minimum of 1" x 4" material

(6) Platform

- (a) The member of a scaffold which supports the workmen, tools, and materials
- (b) Minimum of 2" x 10" material
- (c) Planking shall extend over the last ledger 6" to 12"

(7) Bearing block

- (a) Supports one end of ledger in a single pole scaffold
- (b) Minimum of 2" x 6" material
- (c) Notch not less than 2"

(8) Guard or handrail

- (a) The guard or handrail is a horizontal rail secured to the inside of the uprights to prevent persons from falling from the platform
- (b) Minimum of 2" x 4" material

(9) Toe board

- (a) A barrier placed along the edge of a scaffold platform secured to the poles to guard against the falling of materials
- (b) Minimum of 1" x 6" material

d. Safety

(1) Guardrail - All scaffolds over eight feet in height shall have a guardrail properly attached. Guardrail must be at least 36" and not more than 42" above the platform, extending along the entire length of the exposed side and end thereof, with only such openings as may be necessary for the delivery of materials and entrance of workmen

(2) Keep scaffold in safe condition at all times

(3) Do not alter or remove scaffold while in use

(4) At no time shall the scaffold be overloaded

(5) Do not use for the storage of material except for material being used

(6) No nail shall be subject to a straight pull

(7) Do not permit men to work on icy scaffolds or in times of a high wind

(8) Never use smaller than 8d nail

APPLICATION:

As a member of a team, erect a single-pole scaffold to a specified working height. Scaffold must conform to safety standards and construction practices outlined in the textbook, Modern Carpentry.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (Day 25)

SUMMARY:

ASSIGNMENT:

SG 3ABR-III-1 thru 6. Read unit 9, pages 157 thru 183 in the text, and answer questions 2, 3, 5, 6, 8, 11, 13, 17, 19, and 20 on pages 183 and 184.

INTRODUCTION (Day 26) (First Half)

MOTIVATION:

REVIEW:

OVERVIEW:

CHECK HOME STUDY ASSIGNMENT:

ASSIGNMENT: (cont)

As a member of a team, erect a single-pole scaffold to a specified working height. Scaffold must conform to sfaety standards and construction practices outlined in the textbook, Modern Carpentry.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT:

SG 3ABR55230-III-1 thru 6, read unit 9, pages 157 thru 183 in the text and answer questions 2, 3, 5, 6, 8, 11, 13, 17, 19, and 20 on pages 183 and 184.

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LESSON PLAN (Part I, General)

PPROVAL OFFICE AND DATE CETC/1 May74	INSTRUCTOR
URSE NUMBER ABR55230	COURSE TITLE Carpentry Specialist
LOCK NUMBER II	BLOCK TITLE Building Construction

ESSON TITLE
Roof Construction (Days 26 thru 28)

LESSON DURATION

LASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
15 Hrs	6 Hrs	21 Hrs

POI REFERENCE

AGE NUMBER	PAGE DATE	PARAGRAPH
30	1 May 1974	4

STS/CTS REFERENCE

UMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
ramed Building Carpentry Hand Tools	None	None	SG III-4 WB III-4-P1 Textbook: Modern Carpentry Film: MN6719C

CRITERION OBJECTIVES AND TEACHING STEPS

4a. Given the pitch of the roof, the span of the building and a rafter table, calculate the line length of a common rafter for the building.

(1) Roof type
(2) Rafter types
(3) Rafter layout terms
(4) Framing square
(5) Formulas used in rafter construction

4b. Using a portable electric power saw and carpentry hand tools and working as a member of a team, lay out, cut and construct the roof frame for a wood frame structure. Finished roof frame will include ceiling joists, rafters, ridge board, collar ties, and gable end studs. All materials must be cut within 1/16" of given ecifications and all joints must be tight.

LESSON PLAN (Part I, General) CONTINUATION SHEET

CRITERION OBJECTIVES AND TEACHING STEPS (Continued)

(1) Ceiling joists
(2) Rafters
(3) Ridge board
(4) Collar ties
(5) Gable and studs

3ABR55230 Branch Approved

Days 26 thru 28, Unit 4 Date 1 MAY 1974

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PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (885 Min)

PRESENTATION:

4.a. Given the pitch of the roof, the span of the building and a rafter table, calculate the line length of a common rafter for the building.

- (1) Roof type
  - (a) Gable - Has a double slope meeting at the ridge
  - (b) Hip - Has four slopes meeting at the ridge

(c) Intersecting roof

  1 A combination of two or more roofs

  2 May be T, L, H, U, or I shaped

(d) Flat roof

  1 Has a slight slope one direction

  2 Any roof with a slope of 1" or less per foot of run is considered flat

(e) Shed or Lean-to roof

  1 Is similar to a flat roof

  2 Has a slope of over 1" per foot of run

(f) Gambrel roof - A modification of the gable roof having two slopes on each side of the ridge

(2) Rafter types

(a) Common rafter extends from the double top plate to the ridge at right angles to both the ridge and the plate

(b) Hip rafter - A hip rafter extends from the plate at the outside corner of the building to the ridge

(c) Valley rafter - Extends from the plate to the ridge at the inside corner of an intersection of an extension with the main roof

(d) Hip jack rafter - Extends from the plate to the hip rafter at right angles to the plate

(e) Valley jack rafter - Extends from the valley rafter to the ridge at right angles to the plate

(f) Cripple rafter - Any rafter that touches neither the plate or ridge

(g) Barge rafter - The same as the common rafter except it has no birds mouth and is found on the end of a gable or gambrel

(3) Rafter layout terms

(a) Run of a rafter - the horizontal distance covered by the line length of the rafter

(b) Rise of the rafter - The total vertical distance covered by the line length of the rafter

(c) Building-Span - The distance between building lines measured across the width of the building on a horizontal plane

(d) Unit of run - Always 12" for a common rafter

(e) Unit of rise - The amount in inches that a roof rises per foot of run of the common rafter

(f) Unit of span - The unit of span is always 24"

(g) Projection - The distance the tail of a rafter projects out beyond the building line measured on a level line

(h) Line length of a rafter - The distance between final layout marks, before the rafter is shortened to allow for the opposing member

(i) Rafter length - The distance between final layout marks, before the rafter is shortened to allow for the opposing member

(j) Trail of the rafter - The part of the rafter which projects out beyond the building line

(k) Plumb line (or cut) The finished cut at the top end of a shortened rafter

(l) Birdsmouth - The cut in rafter stock to receive the plate. Composed of two cuts; plumb out and a level cut

(m) Tail cut - The cut at lower end of any rafter that has a tail

(4) Framing square

(a) Uses - the uses of the framing square are unlimited

1 To lay out rafters of all types

2 To lay out square timbers for octagon posts or piers

3 Drawing a circle

4 Finding the center of a circle

5 Finding the size of circle having the area of two circles

(b) Tables

1 Rafter table

  a On the face of the body

  b Used to determine the length of rafters and to make side cuts

2 Essex board measure table

  a On the back of the body of the square

  b Used to determine board measure in feet and fractions of a foot

3 Octagon scale

  a On the tongue of a square

  b Used to lay out octagonal shapes

4 Brace table

  a On the back of the tongue

  b Length of common braces are given in this table

(5) Formulas used in rafter construction

(a) $\text{Pitch} = \frac{\text{Total rise}}{2 \times \text{run}}$

(b) Unit of rise = Pitch x unit of span (24)

(c) Cut of the roof = Unit of run and unit of rise

(d) Total rise = Pitch x span

(e) Line length = Unit of bridge measure x number of steps (run)

(f) Shortening allowance = Half the thickness of ridge board, from the angle of attack

(g) To lay out a plumb line = Use the unit of rise, mark on the unit of rise

(h) To lay out a level line = Use the unit of run and unit of rise, mark on the unit of run

4.b. Using a portable electric power saw and carpentry hand tools and working as a member of a team, lay out, cut and construct the roof frame for a wood frame structure. Finished roof frame will include ceiling joists, rafters, ridge board, collar ties, and gable end studs. All materials must be cut within 1/16" of given specifications and all joints must be tight.

- (1) Ceiling joists
  - (a) Definition - Supporting members for the ceiling
  - (b) Layout - 16" on-center spacing is most common in house framing
  - (c) Cutting procedures
    - 1 Can be cut to the pitch of the roof after the rafters are installed
    - 2 Lay out to cut of roof then install
  - (d) Installation methods
    - 1 Set back and joist to make inside corner ceiling
    - 2 Set to side of stud line to give direct support for rafters
- (2) Rafters - Covered in Presentation 4.a.
- (3) Ridge board
  - (a) Purpose - The ridge board gives a better nailing surface for the top ends of the rafters and holds them on their proper spacing
  - (b) Material - The most common ridge board is 1" x 6" or 2" x 6"
  - (c) Layout
    - 1 Same as top plate

2 Line length of ridge board is the same as the building length (plus projection if desired)

(4) Collar ties (collar beam)

(a) Purpose - A piece of stock (usually 1" x 6") fastened to one pair of rafters in a horizontal position at some desired location between the ceiling joist and the ridge of the roof. Used to strengthen and control spreading of the rafters

(b) Length of collar tie -

$$\frac{\text{Drop in inches} \times 2}{\text{Unit of Rise}} = \text{Length in ft.}$$

(c) Cut of collar tie - Hold unit of run and unit of rise of the common rafter on a framing square and mark on the unit of run side

(5) Gable end studs

(a) Definition

1 Used to frame in the ends of a gable roof

2 Are generally placed directly over the wall studs

(b) Total run - Is equal to the distance from the corner of the building to the center of the gable end stud

(c) Line length - The computed length of the gable end stud with no allowance for material above the birdsmouth of the common rafter

(d) Actual length - The line length plus the amount of material left above the birdsmouth of the common rafter

(e) Side cut - To make the gable end stud fit the rafter, hold the unit of run and unit of rise of the common rafter on a framing square and mark on the unit of rise side

(f) Formulas and layout

1 4/3 x unit of rise = Length of first gable end stud (16" O.C.)

2 4/3 x unit of rise = Common difference in length of gable end studs (16" O.C.)

3 Line length plus amount of material above birdsmouth = Actual length of gable end stud

APPLICATION:

Given the pitch of the roof, the span of the building and a rafter table, calculate the line length of a common rafter for the building.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (Day 26)

SUMMARY:

ASSIGNMENT:

SG 3ABR55230-III-1 through 6. As a member of a team, you will be required to lay out, cut, and install ceiling joists, rafters ridge boards, collar ties, and gable end studs. The procedure for accomplishing these tasks are outlined in Unit 9 of the text. Review these before beginning the actual work.

INTRODUCTION (Day 27)

MOTIVATION:

REVIEW:

OVERVIEW:

CHECK HOME STUDY ASSIGNMENT:

APPLICATION:

Using a portable electric power saw and carpentry hand tools and working as a member of a team, lay out, cut and construct the roof frame for a wood frame structure. Finished roof frame will include ceiling joists, rafters, ridge board, collar ties and gable end studs. All materials must be cut within 1/16" of given specifications and all joints must be tight.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (Day 27)

SUMMARY:

ASSIGNMENT:

SG 3ABR55230-III-1 through 6,
Unit 9 Roof Framing.

INTRODUCTION (Day 28)

MOTIVATION:

REVIEW:

OVERVIEW:

CHECK HOME STUDY ASSIGNMENT:

APPLICATION: (cont)

Using a portable elctric power saw and carpentry hand tools and working as a member of a team, lay out, cut and construct the roof frame for a wood frame structure. Finished roof frame will include ceiling joists, rafters, ridge board, collar ties, and gable end studs. All materials must be cut within 1/16" of given specifications and all joints must be tight.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

ASSIGNMENT:

SG 3ABR55230-III-1 through 6. Read Day 29 Porch and Stairs, Unit 16 Stair Construction, pages 343 through 360. After reading the text, use a sheet of paper and answer questions 1, 2, 3, 5, and 10 on page 360.

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LESSON PLAN (Part I, General)

ORIGINAL OFFICE AND DATE CETC/4Sep74	INSTRUCTOR
COURSE NUMBER ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER III	BLOCK TITLE Building Construction

LESSON TITLE
Porches and Stairs (Day 29)

LESSON DURATION

CLASSROOM/LABORATORY 6 Hrs	COMPLEMENTARY 2 Hrs	TOTAL 8 Hrs

POI REFERENCE

PAGE NUMBER 31	PAGE DATE Changed 26 August 1974	PARAGRAPH 5

STS/CTS REFERENCE

NUMBER 552X0	DATE 15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Carpentry Hand Tools Portable Power Tools	None	None	SG III-5 WB III-5-P1 Textbook; Modern Carpentry Film: MN6719F

CRITERION OBJECTIVES AND TEACHING STEPS

5a. As a member of a team, lay out and cut stair stringers, and construct a set of stairs for a given application. The finished work must be within 1/16" of given specifications and must be plumb and level.

(1) Types of stairs
(2) Stair nomenclature
(3) Stair layout terms
(4) Stair layout theory
(5) Formula

5b. Construct a porch for an existing building. The porch must be sturdy, have e correct drop and be ready for painting.

(1) Porch foundation types
(2) Attachment to building
(3) Construction procedures

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3ABR55230

Day 29, Unit 5

Branch Approved

Date 2 3 JAN 1975

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

CHECK HOME STUDY ASSIGNMENT:

BODY (345 Min)

PRESENTATION:

5.a. As a member of a team, lay out and cut stair stringers, and construct a set of stairs for a given application. The finished work must be within 1/16" of given specifications and must be plumb and level.

(1) Types of stairs

(a) Straight - A flight of stairs without a break

(b) Rough - One which is constructed without the use of riser material

(c) Platform - Contains a rest area between first and second floors

(d) Open - One which has one or both sides open

(e) Closed - One that is built between two walls and is generally used as rear or attic stairs

(f) Winding - One which changes direction by use of steps

(2) Stair nomenclature

(a) Stringer - The structure supports to which the risers and treads are secured

1 Cut out

2 Built up

(b) Tread - Part a person steps on

(c) Riser - Piece of material placed between the two treads to close the opening

(3) Stair layout terms

(a) Total rise - The vertical distance from one finish floor level to another finish floor level

(b) Total run - The overall horizontal distance covered by the stairway

(c) Tread rise - The vertical distance from the top of one tread to the top of the next tread

(d) Tread run - The horizontal distance from from the face of one riser to the face of the next riser

(e) Headroom - The minimum vertical clearance between the tread nosing on a stairway and the open end of the well hole

(4) Stair layout theory

(a) The average and ideal height for a riser is 7"

(b) Tread plus riser should equal 18"

(c) There is always one more riser than there are treads because the upper floor serves as the last tread

(5) Formula

(a) Total rise in inches divided by the desired height of the riser (7") equals the number of risers

(b) Divide the number of risers into total rise in inches (carry out 3 decimal places) which gives you the exact height of riser

(c) Subtract exact height of riser from 18". This gives exact width of tread.

APPLICATION:

As a member of a team, lay out and cut stair stringers, and construct a set of stairs for a given application. The finished work must be within 1/16" of given specifications and must be plumb and level.

PRESENTATION:

5.b. Construct a porch for an existing building. The porch must be sturdy, have the correct drop, and be ready for painting.

- (1) Porch foundation types
  - (a) Wooden post
  - (b) Concrete pier
  - (c) Brick pier
- (2) Attachment to building
  - (a) Bolt
  - (b) Nail
- (3) Construction procedures
  - (a) Set and level foundation
  - (b) Cut and install sills and joist
  - (c) Install flooring

APPLICATION:

Construct a porch for an existing building. The porch must be sturdy, have the correct drop, and be ready for painting.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

As a member of a team, you will be required to install sheathing on outside walls and on a roof. For a reading assignment, review Unit 8 of the text.

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE CETC/1May74	INSTRUCTOR
URSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
LOCK NUMBER II	BLOCK TITLE Building Construction

LESSON TITLE
Sheathing (Day 30)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
4 Hrs	2 Hrs	6 Hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
32	1 May 197[illegible]	6

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
rpentry Hand Tools Framed Building	None	None	SG III-6 WB III-6-P1 Textbook: Modern Carpentry

CRITERION OBJECTIVES AND TEACHING STEPS

6. Working as a member of a team, install sheathing on the outside of a wall and on the top of roof rafters. Joints must be tight and staggered. Nail spacing must be within standard specifications.

a. Purpose of sheathing

b. Material used as sheathing

c. Installation procedures

3ABR55230 Branch Approved Robert [illegible]

Day 30, Unit 6 Date 1 MAY 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

CHECK HOME STUDY ASSIGNMENT:

BODY (225 Min)

PRESENTATION:

6. Working as a member of a team, install sheathing on the outside of a wall and on the top of roof rafters. Joints must be tight and staggered. Nail spacing must be within standard specifications.
    a. Purpose of sheathing
        (1) Strengthens the building
        (2) Acts as an insulation

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b. Material used as sheathing

(1) Wood S4S

(2) Gypsum board

(3) Fiberboard

(4) Plywood

c. Installation procedures

(1) Protection against dampness

(2) Insulation against heat, cold, and wind

APPLICATION:

Working as a member of a team, install sheathing on the side of a wall and on the top of roof rafters. Joints must be tight and staggered. Nail spacing must be within standard specifications.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during the lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

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LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE: TCETC 4Sep74
INSTRUCTOR:
COURSE NUMBER: 3ABR55230
COURSE TITLE: Carpentry Specialist
BLOCK NUMBER: IV
BLOCK TITLE: Building Finish Work
LESSON TITLE: Roofing and Siding (Days 31 and 32)

LESSON DURATION
CLASSROOM/LABORATORY: 12 Hrs
COMPLEMENTARY: 4 Hrs
TOTAL: 16 Hrs

[illegible] REFERENCE
PAGE NUMBER: 34
DATE OF: Changed 26 August 1974
PARAGRAPH: 1

[illegible] REFERENCE
NUMBER: 552X0
DATE: 15 September 1972

[illegible] APPROVAL
SIGNATURE
SIGNATURE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Carpentry Hand Tools Building Mock-up	Roofing Building Felt Staples Siding Nails Trim	None	SG IV-1 WB IV-1-P1 Textbook: Modern Carpentry

CRITERION OBJECTIVES AND TEACHING STEPS

1a. Working as a member of a team, prepare sheathing for roofing or siding by removing ridges or high spots, repairing holes larger than 1" diameter, and applying building paper.

(1) Checking procedures

(2) Methods of removing ridges and high spots

(3) Types and purpose of building paper

(4) Installation procedures

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LESSON PLAN (Part I, General) CONTINUATION SHEET

CRITERION OBJECTIVES AND TEACHING STEPS (continued)

1b. Working as a member of a team, apply roofing of a given type so that exposure equals that recommended by the manufacturer, courses are straight, and material is properly fastened.

(1) Types of roofing

(2) Roofing terms

(3) Installation

1c. Working as a member of a team, install trim and cornice on the surface designated. Openings in joints must not exceed 1/16" and trim must be properly fastened with the recommended fastener.

(1) Trim terms

(2) Corner boards

1d. Working as a member of a team, install siding on a vertical wall. The spacing and splice joints must be within standard specifications. The courses mus be even and the material properly fastened.

(1) Types of siding

(2) Installation procedures

3ABR55230

Days 31 and 32, Unit 1

Branch Approved

Date 1 MAY 1974

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PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

CHECK HOME STUDY ASSIGNMENT:

BODY (705 Min)

PRESENTATION:

1.a. Working as a member of a team, prepare sheathing for roofing or siding by removing ridges or high spots, repairing holes larger than 1" diameter, and applying building paper.

- (1) Checking procedures
  - (a) Condition of sheathing
  - (b) Is removal of existing roofing required?
  - (c) Loose knots larger than 1" must be repaired

(2) Methods of removing ridges and high spots

  (a) Re-nail raised sheathing

  (b) Remove ridges with hatchet or hand ax

(3) Types and purpose of building paper

  (a) 15# felt - most commonly used

  (b) 30# felt - used between courses of wooden shingles

  (c) 90# felt - underlayment for roofing

  (d) Used to turn wind-driven rain and snow

  (e) Allows water vapor to escape

  (f) Prevents roofing from coming in contact with resinous boards

  (g) Serves as temporary roofing or siding

(4) Installation procedures (building felt)

  (a) Chalk line for first course

  (b) Start at lower edge of roof or wall

  (c) Unroll and fasten

  (d) Staples may be used for temporary fastening; use roofing nails or simplex nails for prolonged periods or windy areas

(e) Use 2" top lay; 4" to 6" side lap

(f) Cut with utility knife

PRESENTATION:

1.b. Working as a member of a team, apply roofing of a given type so that exposure equals that recommended by the manufacturer, courses are straight, and material is properly fastened

- (1) Types of roofing
  - (a) Wooden shingles
  - (b) Metal
  - (c) Slate & tile
  - (d) Built-up
  - (e) Composition
- (2) Roofing terms
  - (a) Square
  - (b) Overhang
  - (c) Course
  - (d) Exposure
  - (e) Ridge Cap
  - (f) Top lap
  - (g) Side lap
- (3) Installation (composition roofing)
  - (a) Chalk line for first course

(b) Double first course

(c) Fasten, using 4 or 6 nails (3 tab square butt).

(d) Use half-lap spacing

(e) Use manufacturer's recommended exposure

APPLICATION:

Working as a member of a team, prepare sheathing for roofing or siding by removing ridges or high spots, repairing holes larger than 1" diameter, and applying building paper.

Working as a member of a team, apply roofing of a given type so that exposure equals that recommended by the manufacturer, courses are straight, and material is properly fastened.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (Day 31)

SUMMARY:

ASSIGNMENT:

Read Unit 12, EXTERIOR WALL FINISH, pages 249 through 275, in the textbook, MODERN CARPENTRY.

INTRODUCTION (Day 32)

MOTIVATION:

REVIEW:

OVERVIEW:

CHECK HOME STUDY ASSIGNMENT:

PRESENTATION:

1.c. Working as a member of a team, install trim on the surface designated. Openings in joints must not exceed 1/16" and trim must be properly fastened with the recommended fastener.

(1) Trim terms

(a) Cornice

(b) Soffit

(c) Rake

(d) Fascia

(e) Frieze

(f) Lookout

(g) Ledger

(2) Corner boards

(a) Flush

(b) Lap

(c) Metal

PRESENTATION:

1.a. Working as member of a team, install siding on a vertical wall. The spacing and splice joints must be within standard specifications. The courses must be even and the material properly fastened

- (1) Types of siding
  - (a) Horizontally applied wooden
    - 1 Clapboard
    - 2 Bevel
    - 3 Rabbeted
    - 4 Rustic
    - 5 Drop
  - (b) Vertically applied wooden
    - 1 Tongue and grove
    - 2 Board and Batten
    - 3 Plywood
  - (c) Cement-asbestos shingles
- (2) Installation procedures
  - (a) Horizontally applied wooden
    - 1 Start at bottom edge
    - 2 Nail at each stud
    - 3 Splice at studs
    - 4 Use galvanized or aluminum nails

(b) Vertically applied wooden

  1 Use horizontal blocker strips or blocks not more than 48" apart

  2 Make vertical splices over studs

(c) Cement-asbestos shingles

  1 Cut with shingle cutter

  2 Fasten with aluminum or galvanized nails

  3 Use tabs under joints

  4 Pre-punch all holes

APPLICATION:

Working as a member of a team, install trim on the surface designated. Openings in joints must not exceed 1/16" and trim must be properly fastened with the recommended fastener.

Working as a member of a team, install siding on a vertical wall. The spacing and splice joints must be within standard specifications. The courses must be even and the material properly fastened.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

For Day 33, read, beginning with EXTERIOR DOOR FRAMES, page 238, to page 247, and Unit 17, DOORS AND INTERIOR TRIM, pages 361 through to WINDOW TRIM, page 378, in the textbook, MODERN CARPENTRY.

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LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE CETC/1May74	INSTRUCTOR
COURSE NUMBER ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER IV	BLOCK TITLE Building Finish Work

LESSON TITLE
Doors and Finish Hardware (Days 33 and 34)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
12 Hrs	4 Hrs	16 Hrs

PCI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
35	1 May 1974	2

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
arpentry Hand Tools Building Mock-up Miter Boxes	Door Locksets Door Hinges Trim Weatherstripping	None	SG IV-2 WB IV-2-P1 Textbook: Modern Carpentry Training Film: MN 6719E

CRITERION OBJECTIVES AND TEACHING STEPS

2a. Working as a member of a team, install a door frame and door in an existing opening. The head jamb must be level and the side jamb [illegible]. The [illegible] must open and close without bind[illegible].

(1) Door frames

(2) Doors

2b. Measure, cut, and install trim. A[illegible] appearance.

(1) Types of [illegible]

(2) Fastening

(3) Joints used for tr[illegible]

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LESSON PLAN (Part I, General) CONTINUATION SHEET

CRITERION OBJECTIVES AND TEACHING STEPS (Continued)

2c. Working as a member of a team, install weatherstripping so it will eliminate the possibility of drafts.

(1) Need

(2) Types

(3) Installation

2d. Install a door lock and hinge on a simulated door. Door must lock securely and must open and close without binding.

(1) Types of door hardware

(2) Installation

Days 33 and 34, Unit 2 Date 1 MAY 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

CHECK HOME STUDY ASSIGNMENT:

BODY (705 Min)

PRESENTATION:

2.a. Working as a member of a team, install a door frame and door in an existing opening. The head jamb must be level and the side jambs plumb. The door must open and close without binding.

- (1) Door frames
  - (a) Exterior
  - (b) Interior
- (2) Doors
  - (a) Panel

(b) Flush

(c) Batten

2.b. Measure, cut, and install trim. All joints must be tight and neat in appearance.

(1) Types of trim

(a) Cove

(b) Baseboard

(c) Door and window

(d) Quarter-round

(2) Fastening

(3) Joints used for trim

(a) Butt

(b) Mitered

(c) Coped

(d) Scarf

APPLICATION:

Working as a member of a team, install a door frame and door in an existing opening. The head jamb must be level and the side jambs plumb. The door must open and close without binding.

Measure, cut, and install trim. All joints must be tight and neat in appearance.

EVALUATION:

1. Observe student's performance during lesson.

lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (Day 33)

SUMMARY:

ASSIGNMENT:

For Day 34, read, beginning with WINDOW TRIM, page 278, through to page 382, and answer all questions on page 382, in the textbook MODERN CARPENTRY.

INTRODUCTION (Day 34)

MOTIVATION:

REVIEW:

OVERVIEW:

CHECK HOME STUDY ASSIGNMENT:

PRESENTATION:

2.c. Working as a member of a team, install weatherstripping so it will eliminate the possibility of drafts.

(1) Need

- (2) Types
  - (a) Rubber
  - (b) Felt
  - (c) Metal
  - (d) Neoprene
- (3) Installation

2.d. Install a door lock and hinge on a simulated door. Door must lock securely and must open and close without binding.

- (1) Types of door hardware
  - (a) Hinges
  - (b) Locksets
    - 1 Entrance
    - 2 Passage
    - 3 Rimlock
- (2) Installation

APPLICATION:

Working as a member of a team, install weatherstripping so it will eliminate the possibility of drafts.

Install a door lock and hinge on a simulated door. Door must lock securely and must open and close without binding.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

For Day 35, read, beginning with WINDOWS AND EXTERIOR DOORS, page 215, through to EXTERIOR DOOR FRAMES, page 238, in the textbook, MODERN CARPENTRY. Read the information on glass in the Study Guide.

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE TCETC/1May74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER IV	BLOCK TITLE Building Finish Work

LESSON TITLE
Vents, Louvers, and Window Installation (Day 35)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
6 Hrs	2 Hrs	8 Hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
37	1 May 1974	3

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Louvers Window Frame Building Mock-up Carpentry Hand Tools	Glass Putty Glazier's Points Screen	None	SG IV-3 WB IV-3-P1 Textbook: Modern Carpentry

CRITERION OBJECTIVES AND TEACHING STEPS

3a. Working as a member of a team, install a window frame and sash in an existing opening. The head jambs must be level and the side jambs plumb. The sash must operate freely without binding.

(1) Types of windows

(2) Installation procedures

3b. Repair a window sash by replacing glass. Putty must be smooth and must not show from the backside of the frame.

(1) Types of glass

(2) Cutting glass

(3) Installing glass

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LESSON PLAN (Part I, General) CONTINUATION SHEET

CRITERION OBJECTIVES AND TEACHING STEPS (Continued)

3c. Repair a window screen by replacing screen wire on a frame. The screen wire must be tight and free from buckles and wrinkles.

(1) Types of screen

(2) Screen installation

3d. As a member of a team, install a louver or ventilator in an existing opening. The louver must be square, plumb, and/or level.

(1) Need for vents and louvers

(2) Installation locations and procedures

Day 35, Unit 3

Date 1 MAY 1974

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PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

CHECK HOME STUDY ASSIGNMENT:

BODY (345 Min)

PRESENTATION:

3.a. Working as a member of a team, install a window frame and sash in an existing opening. The head jambs must be level and the side jambs plumb. The sash must operate freely without binding.

- (1) Types of windows
  - (a) Sliding
  - (b) Swinging
  - (c) Fixed

(2) Installation procedures

3.b. Repair a window sash by replacing glass. Putty must be smooth and must not show from the backside of the frame.

- (1) Types of glass
    - (a) Grades
    - (b) Thicknesses - strength
    - (c) Uses
- (2) Cutting glass
    - (a) Safety precautions
        - 1 Wear goggles
        - 2 Carrying glass
        - 3 Cleaning work area
        - 4 Disposal of waste glass
        - 5 Handling glass
    - (b) Procedures
- (3) Installing glass
    - (a) Glazier's points/clips
    - (b) Glazing compound (putty)

3.c. Repair a window screen by replacing screen wire on a frame. The screen wire must be tight and free from buckles and wrinkles.

- (1) Types of screen
    - (a) Galvanized steel
    - (b) Copper
    - (c) Aluminum

(d) Plastic

(2) Screen installation

(a) Fastening

(b) Cutting

3.d. As a member of a team, install a louver or ventilator in an existing opening. The louver must be square, plumb, and/or level.

(1) Need for vents and louvers

(a) Explain dewpoint

(b) Attic temperatures

(2) Installation locations and procedures.

APPLICATION:

Working as a member of a team, install a window frame and sash in an existing opening. The head jambs must be level and the side jambs plumb. The sash must operate freely without binding.

Repair a window by replacing glass. Putty must be smooth and must not show from the backside of the frame.

Repair a window screen by replacing screen wire on a frame. The screen wire must be tight and free from buckles and wrinkles.

As a member of a team, install a louver or ventilator in an existing opening. The louver must be square, plumb, and/or level.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

Assignment for Day 36; Read, beginning with Types of Insulation, page 283, through to Accustics and Sound Control, page 296, in MODERN CARPENTRY. Read Unit 14, Interior Wall and Ceiling Finish, pages 307 through 330.

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LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE TCETC 4Sep74	INSTRUCTOR
COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER IV	BLOCK TITLE Building Finish Work

LESSON TITLE
Insulation, Interior Walls, Flooring, and Prefab Units (Days 36 and 37)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
12 Hrs	0	12 Hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
38	Changed 26 August 1974	4

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Building Mock-up Tacker-Stapler Carpentry Hand Tools	Insulation Gypsum Board Acoustical Material Paneling Wooden Flooring Asphalt Flooring Laminated Plastic	None	SG IV-4 WB IV-4-P1 Textbook: Modern Carpentry

CRITERION OBJECTIVES AND TEACHING STEPS

4a. Working as a member of a team, install insulation in an existing wall with exterior sheeting. The insulation must be smooth, and the vapor barrier and reflective surface properly placed.

(1) Need for insulation
(2) Types of insulation
(3) Installation procedures
(4) Qualities desired for insulation

4b. Working as a member of a team, install gypsum board on an existing wall section. The spaces between the adjoining pieces must not exceed 1/4 inch.

(1) Layout and cutting of gypsum board
(2) Nail spacing
(3) Installation techniques

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4c. Working as a member of a team, install acoustical material. The borders must be symmetrical and the surface smooth.

(1) Layout and installation
(2) Fastening methods
(3) Cutting

4d. Working as a member of a team, install paneling on an existing wall section. Each panel must be plumb, and the joints tight and inconspicuous.

(1) Types of materials
(2) Fastening devices and methods
(3) Installation techniques

4e. Working as a member of a team, install subflooring, and then install wood flooring on the subfloor. The flooring must run parallel with the longest side of the room, the nails must not show, and the joints must be tight and neat.

(1) Types of subflooring
(2) Installation of subflooring
(3) Types of flooring
(4) Installation procedures.

4f. Repair a wooden floor by removing the damaged section. The repaired section must be tight and inconspicuous.

(1) Removal procedure
(2) Tools
(3) Replacement selection
(4) Replacement techniques

4g. Repair asphalt flooring by removing and replacing damaged sections. Repaired section must be smooth and without bulges, and all joints must be tight and inconspicuous.

(1) Linoleum floor covering
(2) Types and sizes of floor tiles
(3) Installation procedures
(4) Removal and replacement procedures

4h. Working as a member of a team, install a prefabricated cabinet or bookcase on a wall. Installed unit must be level and secure enough to hold its designed weight.

(1) Fastening devices
(2) Installation procedures

41. Working as a member of a team, install a section of laminated plastic. The finished job must have a smooth surface with maximum adhesion.

(1) Cutting material
(2) Installation procedures

300

3ABR55230

Days 36 and 37, Unit 4

Branch Approved John Paulson

Date 31 JAN 1975

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

CHECK HOME STUDY ASSIGNMENT:

BODY (705 Min)

PRESENTATION:

4.a. Working as a member of a team, install insulation in an existing wall with exterior sheeting. The insulation must be smooth, and the vapor barrier and reflective surface properly placed.

(1) Need for insulation

307

(2) Types of insulation

(3) Installation procedures

(4) Qualities desired for insulation

(a) Durable

(b) Fire resistant

(c) Vermin proof

(d) Economical

4.b. Working as a member of a team, install gypsum board on an existing wall section. The spaces between the adjoining pieces must not exceed 1/4 inch.

(1) Layout and cutting of gypsum board

(2) Nail spacing

(3) Installation techniques

4.c. Working as a member of a team, install acoustical material on a ceiling. The borders must be symmetrical and the surface smooth.

(1) Layout and installation

(2) Fastening methods

(3) Cutting

4.d. Working as a member of a team, install paneling on an existing wall section. Each panel must be plumb, and the joints tight and inconspicuous.

(1) Types of materials

(2) Fastening devices and methods

(3) Installation techniques

APPLICATION:

Working as a member of a team, install insulation in an existing wall with exterior sheeting. The insulation must be smooth, and the vapor barrier and reflective surface properly placed.

Working as a member of a team, install gypsum board on an existing wall section. The spaces between the adjoining pieces must not exceed 1/4 inch.

Working as a member of a team, install acoustical material on a ceiling. The borders must be symmetrical and the surface smooth.

Working as a member of a team, install paneling on an existing wall section. Each panel must be plumb and the joints tight and inconspicuous.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (Day 36)

SUMMARY:

ASSIGNMENT:

For Day 37, read Unit 15, beginning on page 331 through to page 345, and beginning with Counters and Tops, page 396, through to Cabinet Hardware, page 399, in the textbook, MODERN CARPENTRY.

INTRODUCTION (Day 37)

MOTIVATION:

REVIEW:

OVERVIEW:

PRESENTATION:

4.e. Working as a member of a team, install subflooring and then install wood flooring on the subfloor. The flooring must run parallel with the longest side of the room, the nails must not show, and the joints must be tight and neat.

(1) Types of subflooring

(2) Installation of subflooring

(3) Types of flowing

(4) Installation procedures

4.f. Repair a wooden floor by removing the damaged section. The repaired section must be tight and inconspicuous.

(1) Removal procedure

(2) Tools

(3) Replacement selection

(4) Replacement techniques

4.g. Repair asphalt flooring by removing and replacing damaged sections. Repaired section must be smooth and without bulges, and all joints must be tight and inconspicuous.

(1) Linoleum floor covering

(2) Types and sizes of floor tiles

(3) Installation procedures

(4) Removal and replacement procedures

4.h. Working as a member of a team, install a prefabricated cabinet or bookcase on a wall. Installed unit must be level and secure enough to hold its designed weight.

(1) Fastening devices

(2) Installation procedures

4.1. Working as a member of a team, install a section of laminated plastic. The finished job must have a smooth surface with maximum adhesion.

(1) Cutting material

(2) Installation procedures

APPLICATION:

Working as a member of a team, install subflooring, and then install wood flooring on the subfloor. The flooring must run parallel with the longest side of the room, the nails must not show, and the joints must be tight and neat.

Repair a wooden floor by removing the damaged section. The repaired section must be tight and inconspicuous.

Repair asphalt flooring by removing and replacing damaged sections. Repaired section must be smooth and without bulges, and all joints must be tight and inconspicuous.

Working as a member of a team, install a prefabricated cabinet or bookcase on a wall. Installed unit must be level and secure enough to hold its designed weight.

Working as a member of a team, install a section of laminated plastic. The finished job must have a smooth surface with maximum adhesion.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

Read prefabricated building erection in study guide.

LESSON PLAN (Part I, General)

TCETC 9Dec74

COURSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER IV	BLOCK TITLE Building Finish Work

LESSON TITLE
Prefabricated Building Erection (Days 38 and 39)

CLASSROOM/LABORATORY 11 Hrs	SUPPLEMENTARY 0	TOTAL 11 Hrs
39	26 August 1974	5
552X0		15 September 1972

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Metal Prefab Building Common Hand Tools	Twist Drills Bolts Screws, Metal	None	SG IV-5 WB IV-5-P1 Textbook: Modern Carpentry Manufacturer's Instruction

CRITERION OBJECTIVES AND TEACHING STEPS

5. As a member of a team, assemble and erect a metal building on an existing foundation. The building must be square, the walls plumb, and the building components secure.

   a. Types of prefabricated buildings

   b. Advantages of prefabricated buildings

   c. Erection procedures for metal prefabricated buildings

3ABR55230

Days 38 and 39, Unit 5

Branch Approved Robert L Fenno

Date 1 MAY 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (645 Min)

PRESENTATION:

5. As a member of a team, assemble and erect a metal building on an existing foundation. The building must be square, the walls plumb, and the building components secure

    a. Types of prefabricated buildings.

    b. Advantages of prefabricated buildings

    c. Erection procedures for metal prefabricated buildings

(1) Manufacturer's drawings

(2) Manufacturer's instructions

APPLICATION:

As a member of a team, assemble and erect a metal building on an existing foundation. The building must be square, the walls plumb, and the building components secure.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (Day 38)

SUMMARY:

ASSIGNMENT:

INTRODUCTION (Day 39)

MOTIVATION:

REVIEW:

APPLICATION: (cont)

As a member of a team, assemble and erect a metal building on an existing foundation. The building must be square, the walls plumb, and the building components secure.

NOTE: Students will continue work on prefabricated building, accomplishing as much as time and learning situation permits.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

Read Heavy Timber Construction in Study Guide.

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE CETC/1May74	INSTRUCTOR
URSE NUMBER 3ABR55230	COURSE TITLE Carpentry Specialist
BLOCK NUMBER IV	BLOCK TITLE Building Finish Work

LESSON TITLE
Heavy Timber Construction (Day 39)

LESSON DURATION

CLASSROOM/LABORATORY	COMPLEMENTARY	TOTAL
1 Hr	0	1 Hr

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
41	1 May 1974	6

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Common Hand Tools Crosscut Saw Docking Saw Hoisting Device	None	None	SG IV-6

CRITERION OBJECTIVES AND TEACHING STEPS

6a. Working as a member of a team, position a heavy timber with a hoist.

(1) Need for hoists

(2) Use and operation

6b. Working as a member of a team, cut heavy timbers to a specific dimension, as required for repair of heavy timber structures.

(1) Saws for heavy timber

(2) Operation of docking saw

ATC FORM AUG 72 770

3ABR55230

Day 39, Unit 6

Branch Approved Robert L Ferrand

Date 1 MAY 1974

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (45 Min)

PRESENTATION:

6.a. Working as a member of a team, position a heavy timber with a hoist.

- (1) Need for hoists
- (2) Use and operation
    - (a) Tripod
    - (b) Scissors
    - (c) Gin pole
    - (d) Block and tackle
    - (e) Power-pull

6.b. Working as a member of a team, cut heavy timbers to a specific dimension, as required for repair of heavy timber structures.

(1) Saws for heavy timber

(2) Operation of docking saw

APPLICATION:

Working as a member of a team, position a heavy timber with a hoist.

Working as a member of a team, cut heavy timbers to a specific dimension, as required for repair of heavy timber structures.

EVALUATION:

1. Observe student's performance during lesson.
2. Evaluate by questions during lesson.
3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

320

ASSIGNMENT AND CLOSURE:

374

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE: TCETC 9Dec74

INSTRUCTOR:

COURSE NUMBER: 3ABR55230

COURSE TITLE: Carpentry Specialist

BLOCK NUMBER: IV

BLOCK TITLE: Building Finish Work

LESSON TITLE: Man-hour and Material Estimation (Day 40)

LESSON DURATION

CLASSROOM/LABORATORY	SUPPLEMENTARY	TOTAL
2 hrs	0	2 hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
42	26 August 1974	7

STS/CTS REFERENCE

NUMBER	DATE
552X0	15 September 1972

SUPERVISOR'S APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
None	None	None	SG IV-7 WB IV-7-P1

CRITERION OBJECTIVES AND TEACHING STEPS

7. Given a simple carpentry project, estimate the type and amount of materials, the amount of man-hours, tools and equipment required to complete the project and state the method of reporting material deficiencies.

   a. Estimating materials

   b. Using charts for man-hour estimation

   c. Reporting material deficiencies

321

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3ABR55230

Day 40, Unit 7

Branch Approved John Paulson

Date 6 Feb 1975

PART II

INTRODUCTION (5 Min)

ATTENTION:

OVERVIEW:

MOTIVATION:

BODY (105 Min)

PRESENTATION:

7. Given a simple carpentry project, estimate the type and amount of materials, the amount of man-hours, tools and equipment required to complete the project and state the method of reporting material deficiencies.

   a. Estimating materials

   b. Using charts for man-hour estimation

   c. Reporting material deficiencies

322

APPLICATION:

Given a simple carpentry project, estimate the type and amount of materials, the amount of man-hours, tools and equipment required to complete the project and state the method of reporting material deficiencies.

EVALUATION:

1. Observe student's performance during lesson.

2. Evaluate by questions during lesson.

3. Evaluate by oral or written quiz.

CONCLUSION (10 Min)

SUMMARY:

REMOTIVATION:

ASSIGNMENT AND CLOSURE:

No assignment required.

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Department of Civil Engineering Training

Carpentry Specialist

3-15

INTRODUCTION TO CARPENTRY

11 July 1973

SHEPPARD AIR FORCE BASE

75-5-30

Designed For ATC Course Use

DO NOT USE ON THE JOB

PURPOSE OF STUDY GUIDES AND WORKBOOKS

Study Guides and Workbooks are training publications authorized by Air Training Command (ATC) for student use in ATC courses.

The STUDY GUIDE (SG) presents the information you need to complete the unit of instruction, or makes assignments for you to read in other publications which contain the required information.

The WORKBOOK (WB) contains work procedures designed to help you achieve the learning objectives of the unit of instruction. Knowledge acquired from using the student study guide will help you perform the missions or exercises, solve the problems, or answer questions presented in the workbook.

THE STUDY GUIDE AND WORKBOOK (SG/WB) contains both SG and WB material under one cover. The two training publications may be combined when the WB is not designed for you to write in, or when both SG and WB are issued for you to keep.

Training publications are designed for ATC use only. They are updated as necessary for training purposes, but are NOT to be used on the job as authoritative references in preference to Technical Orders or other official publications.

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CARPENTRY SPECIALIST

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This supersedes SGs 3ABR55230-I-1 and -3, 3 October 1972; 3ABR55230-I-4, 4 November 1971, 3ABR55230-I-6, 27 October 1971 and WBs 3ABR55230-I-2-P1, 24 March 1972 and 3ABR55230-I-3-P1, 4-P1, 5-P1, 9-P1, and 13-P1, 3 October 1972.

Dept of Civil Engineering Tng
Sheppard AFB, Texas

SG 3ABR55230-I-1
11 July 1973

ORIENTATION AND COURSE INTRODUCTION

OBJECTIVE

The objective of this study guide is to introduce you to course policies and content.

INTRODUCTION

In 1947, the Air Force was separated from the Army to become an independent branch of the Armed Forces. It was given a leading role in defending our country. To accomplish this mission, the Air Force established a number of commands, each of which plays a specific part in national defense.

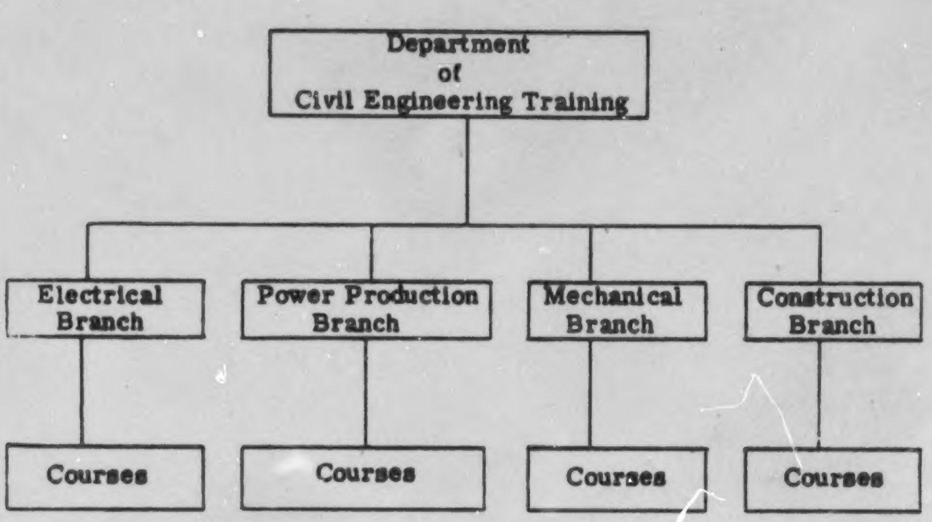
Not every airman in the Air Force flies up and down the coast watching for the enemy. Some are prepared to attack the enemy at their home base; some work to keep buildings repaired so that personnel can be housed and aircraft can be repaired; some see that vital supplies arrive when needed. Others train technical experts to "keep 'em flying." Not all fly, nor do all work with aircraft or missiles, but all do work together to accomplish the primary mission of the Air Force--Maintaining Peace.

COURSE POLICIES AND CONTENT

The Department of Civil Engineering Training consists of four branches. Each branch consists of several courses.

The Carpentry Specialist course belongs to one of the branches. See figure 1 for a breakdown.

The Department Chief is a civil engineer (usually a Colonel or Lt Colonel), who has supervision and responsibilities over the four branches. All officers, as well as key civilian and military personnel, perform administration supervision for each of the courses assigned them.


Department of Civil Engineering Training
Electrical Branch
Power Production Branch
Mechanical Branch
Construction Branch
Courses
Courses
Courses
Courses

CA-033

Figure 1. Department Structure

Each of the courses have key civilian and military personnel who exercise supervisory responsibilities over several instructors. The instructors, in turn, not only exercise supervisory functions, but also teach the subject matter to the students.

Course Content

This course is broken down into four blocks and extends through 40 days' instruction. The course is broken down as follows:

BLOCK I

Day 1	Orientation and Course Introduction, Base Civil Engineer Organization and Career Field Orientation, and Safety.
2	Resource and Work Force Management, and Shop Math
3	Publications
5	Building Materials
6 & 7	Interpreting Drawings
8, 9 & 10	Project Construction, Measurement and Critique

BLOCK II

Day 11	Selecting and Cutting Material for Cabinet Construction
12	Cabinet Framework, Sides and Top
13	Joints
14	Trim Work
15	Curved Edge Sanding
16	Surface Sanding and Decorative Shaping
17	Edge Finishing
18, 19 & 20	Cabinet Assembly and Finishing, Measurement and Critique

BLOCK III

Day 21	Foundations and Form Construction
22 thru 25	Light Frame Construction
25 & 26	Scaffold Construction
26 thru 28	Roof Construction
29	Porches and Stairs
30	Sheathing, Measurement and Critique

BLOCK IV

Day 31 & 32	Roofing and Siding
33 & 34	Doors and Finish Hardware
35	Vents, Louvers, and Window Installation
36 & 37	Insulation, Interior Walls, Flooring, and Prefab Units
38 & 39	Prefabricated Building Erection
39	Heavy Timber Construction
40	Man-Hour and Material Estimation, Communications Security, Measurement and Critique

School Procedures and Regulations

During your enrollment in the course, you are required to abide by the procedures and regulations that govern school activities on this base. These procedures and regulations are established to provide you with the most advantageous training environment possible. This portion of the study guide is devoted to acquainting you with these procedures and regulations.

CLASS LEADER. Regulations require that each class have a class leader. The class leader is appointed the first day of class. Usually, the duties of the class leader are assigned to the highest ranking military man in the class. If all members of the class have equal rank, the instructor will appoint the class leader.

The class leader supervises the class in the absence of the instructor and while the class is performing cleanup at the end of the day. The class leader also acts as spokesman for the class anytime the class has an issue they feel should be brought to the attention of the instructor in keeping proper account of course tools and equipment.

SCHOOL HOURS. Normal classroom training is conducted on six hour shifts. "A" shift is from 0600 to 1200 hours. "B" shift is from 1200 to 1800 hours. You will go to school six hours each day. Instructors and reference books will be available to you an additional two hours per day.

BREAKS. Breaks are authorized during the six hours of instruction so that you may take care of personal needs without missing instruction. You are encouraged to take advantage of breaks to stretch, get fresh air, or a drink of water. You must not, however, leave the break area without permission.

SMOKING. Before lighting up a smoke, be sure you are in an approved area, since certain rooms and areas use inflammable materials. Areas must be approved by the Base Fire Marshal before smoking can be permitted.

SICK CALL. Routine sick call should be taken care of during the hours that school is not in session. If you should become sick while in school, you must obtain an excuse slip before leaving school. In case of serious sickness or accident, your instructor will call an ambulance immediately.

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TESTS. You will be given a formal test at the end of days 10, 20, 30, and 40. Formal block tests will be averaged to arrive at your final course grade. An average score of 60 and above is passing. If you should get a grade of below 60, you may be required to repeat the block of instruction or you may be probationally continued. In either case, you will have to be retested. Quizzes may be given each day or from time to time during the course. These short tests are not used to arrive at a block or course grade. You should take advantage of the results of these daily quizzes to determine how you are doing in each block. Low grades should serve as a warning that you may need to buckle down and do some more studying.

CHAIN OF COMMAND. You, as a member of the Air Force, know that the "Chain of Command" must be followed. The chain of command at Sheppard AFB as it applies to you follows. Your instructor will provide you with the names of the people concerned. Write them in the blank spaces opposite their title.

Student (You) ______________________________

Class Leader ______________________________

Instructor

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________
7. ______________________________
8. ______________________________
9. ______________________________
10. ______________________________

Shift Supervisor ______________________________

Course Supervisor ______________________________

Branch Chief ______________________________

Department Chief ______________________________

Tech School Commander ______________________________

Sheppard Base Commander ______________________________

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FIRE EVACUATION. Your instructor will inform you as to how a fire alarm is sounded and how you should leave the building. The number you should call in the event you detect a fire is 2117.

DISASTER CONTROL PLAN. When a disaster is evident, a signal will be given to warn the base of danger. Your instructor will tell you what to do.

SUMMARY

This study guide has contained a brief outline of the course content and some of the policies with which you should be familiar. Feel free to ask your class leader, your instructor or the course supervisor any questions you might have during your attendance. You are expected to do your best, so now it is up to you!

QUESTIONS

1. How many blocks of instruction are in this course?

2. How many hours of instruction are in this course?

3. What are two purposes of the daily quiz?

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BASE CIVIL ENGINEER ORGANIZATION AND CAREER FIELD ORIENTATION

OBJECTIVE

When you have completed this unit of instruction you will be able to better understand your job in the Air Force.

INTRODUCTION

Carpentry is a branch of the woodworking industry which is concerned with the building of structures. It includes the building of forms, as well as construction of the building frame, roof, and interior trim. It also includes the manufacture and installation of cabinets and shelves.

A qualified carpenter must be skilled in the use of a wide variety of handtools, portable power tools, and shop equipment. A carpenter must know the characteristics of many different kinds of building materials. He must be able to read plans and blueprints; he must be able to estimate the amount of materials and the time required to do a job.

The carpenter's job is often dependent upon weather conditions and progress of construction. Much of a carpenter's job is done in conjunction with other tradesmen, such as masons, plasters, plumbers, and electricians. As a consequence, you should know where you fit in the Base Civil Engineer Organization.

This study guide is divided into two main subjects.

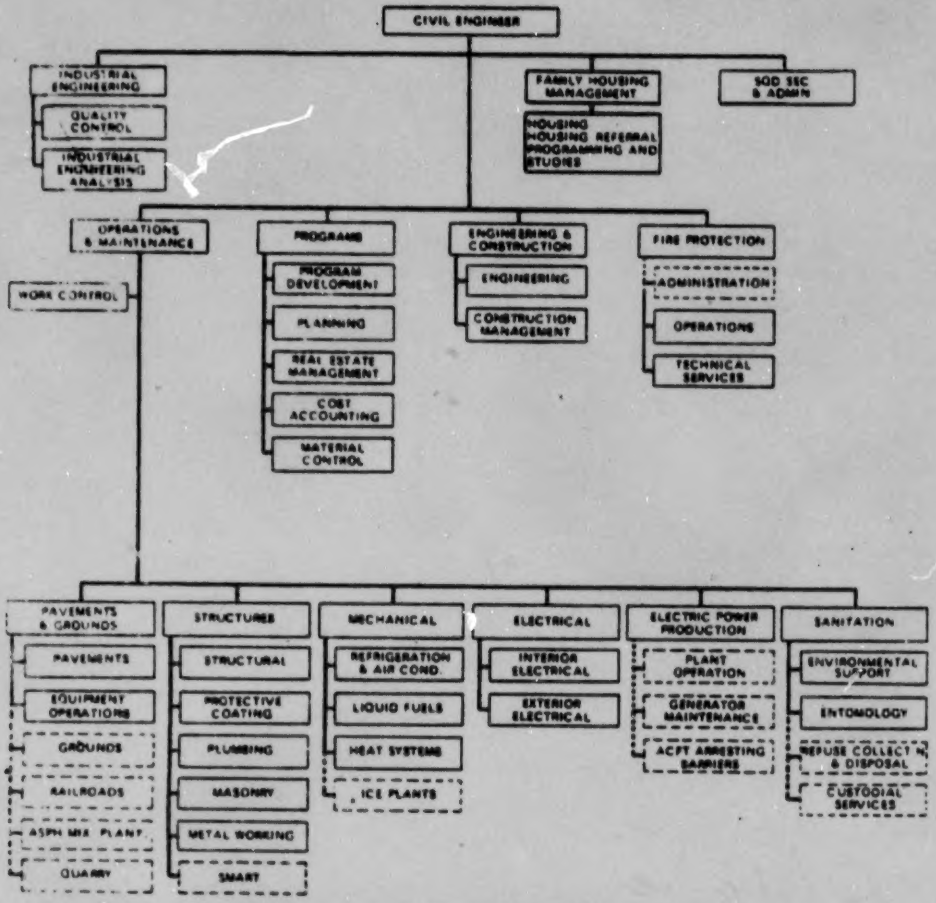
- BASE CIVIL ENGINEER ORGANIZATION
- CAREER FIELD ORIENTATION

BASE CIVIL ENGINEER ORGANIZATION

The base civil engineering organization is responsible for the purchase, construction, maintenance, and operation of the base real property facilities. It is responsible for such functions as construction and maintenance of buildings, building and maintenance of roads and lawns, operation of water supply facilities, provision of fire protection, and even the responsibility for the control of insects and rodents.

Organization

Figure 2 shows the layout of a typical base civil engineer organization. The organization to which you will be assigned will be either a civil engineering group or a civil engineering squadron. In most cases, assignments are made to squadrons, since groups are not too common and are found only on the larger bases.


CIVIL ENGINEER
INDUSTRIAL ENGINEERING
QUALITY CONTROL
INDUSTRIAL ENGINEERING ANALYSIS
FAMILY HOUSING MANAGEMENT
HOUSING
HOUSING REFERRAL
PROGRAMMING AND STUDIES
SQD SEC & ADMIN
OPERATIONS & MAINTENANCE
WORK CONTROL
PROGRAMS
PROGRAM DEVELOPMENT
PLANNING
REAL ESTATE MANAGEMENT
COST ACCOUNTING
MATERIAL CONTROL
ENGINEERING & CONSTRUCTION
ENGINEERING
CONSTRUCTION MANAGEMENT
FIRE PROTECTION
ADMINISTRATION
OPERATIONS
TECHNICAL SERVICES
PAVEMENTS & GROUNDS
PAVEMENTS
EQUIPMENT OPERATIONS
GROUNDS
RAILROADS
ASPH MIX PLANT
QUARRY
STRUCTURES
STRUCTURAL
PROTECTIVE COATING
PLUMBING
MASONRY
METAL WORKING
SMART
MECHANICAL
REFRIGERATION & AIR COND.
LIQUID FUELS
HEAT SYSTEMS
ICE PLANTS
ELECTRICAL
INTERIOR ELECTRICAL
EXTERIOR ELECTRICAL
ELECTRIC POWER PRODUCTION
PLANT OPERATION
GENERATOR MAINTENANCE
ACFT ARRESTING BARRIERS
SANITATION
ENVIRONMENTAL SUPPORT
ENTOMOLOGY
REFUSE COLLECT'N & DISPOSAL
CUSTODIAL SERVICES

NOTE 1 SEE AFM 26-2 AND AFR 85-5 FOR STANDARD ORGANIZATIONAL STRUCTURE AND POLICY

2 THIS CHART SUPPLEMENTS AFM 26-2 AND ILLUSTRATES THE PREFERRED ORGANIZATIONAL PLACEMENT FOR SOME SUB-FUNCTIONS THAT MAY BE REQUIRED AT MAJOR INSTALLATIONS. SEPARATE IDENTIFICATION OF FUNCTIONAL ELEMENTS IS FOR PURPOSES SUCH AS CLARITY AND UNDERSTANDING. IT IS NOT INTENDED TO ESTABLISH A REQUIREMENT FOR INDIVIDUAL WORK CENTERS.

3 INDIVIDUAL TOTAL MAINTENANCE CENTERS (E. G., FAMILY HOUSING, MEDICAL FACILITIES, ETC.) ARE NOT ILLUSTRATED. MAJOR COMMANDS HAVE THE OPTION OF ESTABLISHING SUCH CENTERS WITH THE CENTER SUPERVISORS REPORTING DIRECTLY TO THE CHIEF OF O&M. ECONOMICS OF OPERATION OR CONSIDERATION OF NUMBERS OF PERSONNEL INVOLVED ARE BASIC DETERMINING FACTORS.

4 ORGANIZATIONAL SUBELEMENTS WITHIN MAJOR FUNCTIONAL AREAS MAY BE VERTICALLY EXPANDED OR CONTRACTED WHERE ECONOMICAL AND/OR OPERATIONAL CONSIDERATIONS DICTATE, WITH APPROVAL BY MAJOR COMMAND.

5 STRUCTURAL MAINTENANCE AND REPAIR TEAM (SMART) WILL BE MANNED FROM EXISTING WORK CENTER RESOURCES SINCE WORK LOAD AND MANNING STANDARDS (AFM 26-3) ARE BASED UPON SPECIFIC WORK CENTER REQUIREMENTS. THESE WORK LOAD REQUIREMENTS ARE COMBINED FOR SMART OPERATIONS, COSTING, PERSONNEL, AND ORGANIZATIONAL PLACEMENT PURPOSES.

CA-014A

Figure 2. BCE Organization

Now, let's take a look at the organization. The officer who commands the base civil engineer organization is the base civil engineer (BCE). The prime duty of the BCE is the operation and maintenance of the real property of the base. Included in this is the purchase and disposition, accountability and inventory, and the design and construction of facilities. Some of the other responsibilities of the BCE include traffic engineering, utilities and services, structure and aircraft fire protection, recovery from damage or destruction from enemy attack or natural disasters and support of tenant activities.

Function

The organization chart in figure 2 shows that there are six major functional areas in the base civil engineering organization. The base civil engineer organization is commonly referred to as CE.

SQUADRON. You are probably already familiar with the duties of this section because this section handles the administrative work of the CE organization. The administrative section receives, distributes, and dispatches all communications for CE; prepares reports and correspondence; maintains correspondence files; maintains the CE library; conducts special programs, such as Zero Defects, fund drives, and awards; and supervises the recordkeeping and preparation of reports for the cost reduction program.

The squadron section also takes personnel actions that are delegated by the squadron commander. Some of these duties include counseling, maintaining duty rosters, conducting general military training and commander's call, and enforcing discipline.

INDUSTRIAL ENGINEERING. This section, depicted on the left side of figure 2, serves as a general evaluation and advisory group. It evaluates work performed by all CE personnel and inspects facilities, equipment, programs, and procedures. It identifies deficiencies and recommends corrective action. If the size of the base warrants an automated system, the industrial engineering section would implement it and monitor and interpret the results.

The industrial engineering section is composed of two units, (1) the quality control unit and (2) the industrial engineering analysis unit. The quality control unit inspects in-house and self-help work while it is in progress to determine work quality, work force efficiency, supervisor adequacy, and directive compliance. This unit also checks the adequacy and quality of the supplies that are used while the work is being performed.

OPERATIONS AND MAINTENANCE. This section directs, coordinates, and controls all work approved and authorized to be done by the CE work force. Personnel of this section serve as consultants during the design of real facilities or alterations of old facilities. They are also responsible for annual and long-range work planning and for coordinating resources for plans and programs. This organization provides maintenance data and effectiveness summaries for better management policies.

The work control center of operations and maintenance serves as a staff activity to the operations and maintenance officer. This section assigns priorities and schedules work to appropriate work centers. Normally, this section also operates the service call system and controls the use of vehicles assigned to CE.

The main work areas under operations and maintenance are pavements and grounds, structures, mechanical, electrical, electric power production, and sanitation. Each of these areas may contain several work centers. For instance, the structures area has carpentry, protective coating, plumbing, masonry, and metal work centers. Sometimes there are variations if there is no need for a particular activity. For example, if a base has commercial power, there is no power production work center.

FIRE PROTECTION. This section administers fire prevention programs and performs fire control services. It also inspects and tests fire protection and fire alarm systems, as well as servicing ground-type portable fire extinguishers.

PROGRAMS. CE financial matters are managed by personnel of this section. The programs section is also responsible for financial plans, budgets, and annual and long-range work plans. It approves work requests and obtains materials to accomplish the approved work.

ENGINEERING AND CONSTRUCTION. The architectural and professional engineering services for CE are handled through this section. Problems beyond the capability of operations and maintenance people are referred to the professional engineers of this section. It also reviews and develops technical provisions of contracts for real property facilities.

Some of the additional duties performed by this section are the preparation of architectural and engineering aspects of the base master plan by preparing architectural and engineering aspects of the base master plan by preparing architectural and engineering drawings, and maps and collecting data. In addition, personnel in this section monitor all real property facilities and systems to develop improvements and to update systems or equipment. They make technical inspections on all maintenance, repair, construction, and service work done by contract to assure quality work and contract compliance.

From this review of the organization and functions of the BCE organization, you can likely see where you fit into the larger picture. But what about you as a person in this organization--that is, what are my duties and how do I progress in my carpentry career field? In the next section you should find the answers.

CAREER FIELD ORIENTATION

You have had a chance to see that a civil engineer organization requires a variety of professional people and tradesmen to operate and maintain the many facilities for a base, each with specific jobs to perform.

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These jobs fall into distinct categories called Air Force Specialty Codes (AFSCs). The different categories are identified by numbers. Each number of the code has a meaning. Figure 3 explains the breakdown of AFSC 55250. You will be awarded AFSC 55250 when you acquire the knowledge provided by this course and learn the skills through on-the-job training.

First Two	55	Career Field	Airman Civil Engineering Structural Pavements
Third	2	Career Field Subdivision	Structural
Fourth	5	Skill Level of AFS	Skilled Level
Fifth	0	Specific Air Force Specialty	Carpenter

Figure 3. AFSC 55250 Breakdown

Figure 4 is a chart showing progression in the structural/pavements career field. To see how you can progress in your career field ladder, start at the block with the heavy broken lines and follow the heavy solid lines to the skill level you are studying for now. After you earn AFSC 55250, you will be placed on OJT and enrolled in the CDC for the next level, structural technician, AFSC 55270. Notice in figure 4 that the carpentry and masonry career fields merge at the 7 level.

The structural superintendent level (AFSC 55295) is the next step for you after you have gained experience as a structural technician.

Along the left side of the chart are corresponding increases in rank for you. When you are awarded the carpentry specialist, AFSC 55250, you will also be eligible for E-6 and E-7 ratings when you are awarded AFSC 55270. When you progress to AFSC 55295, structural superintendent, you will be eligible for E-8 or E-9.

The duties and responsibilities of each AFSC differ. Your duties and responsibilities are outlined in Air Force Manual 39-1, Airman Classification Manual. A portion of that manual showing the duties and responsibilities is printed in figure 5.

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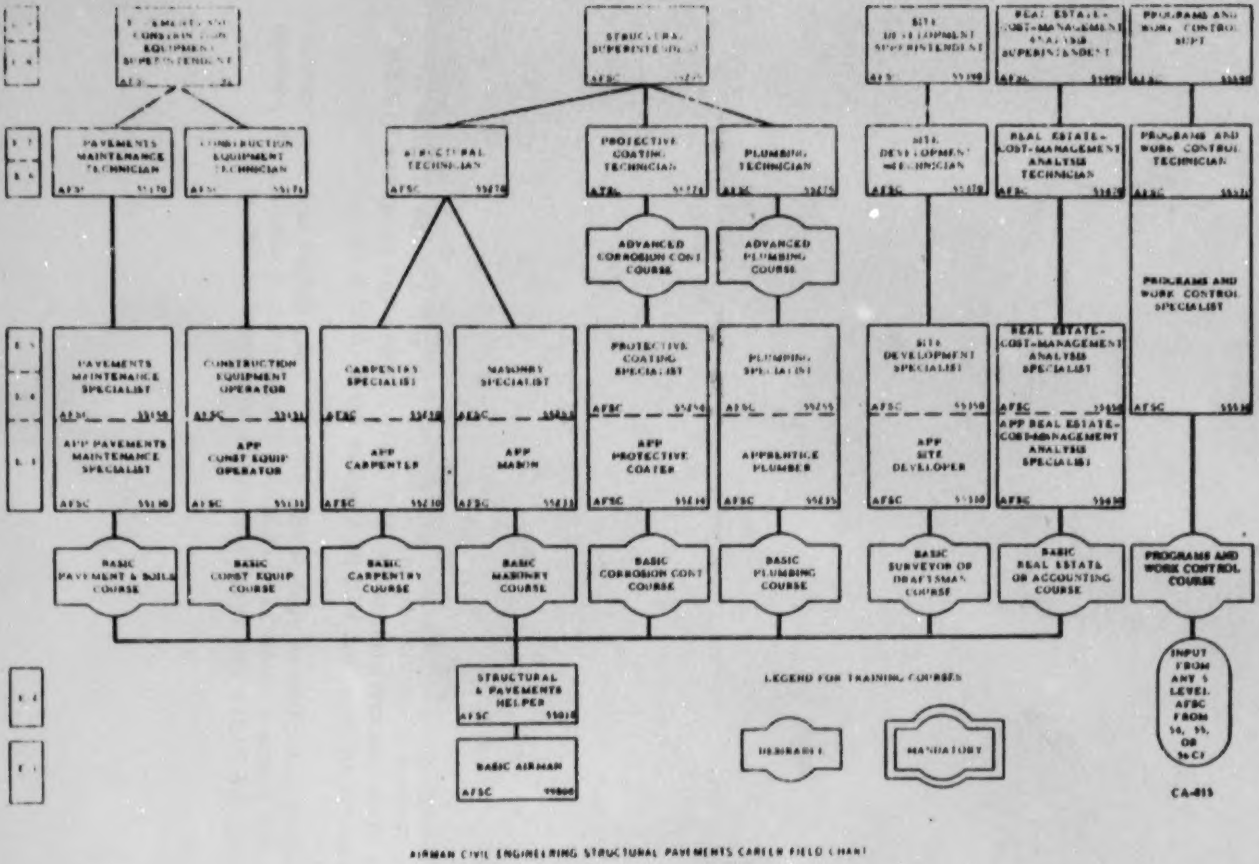
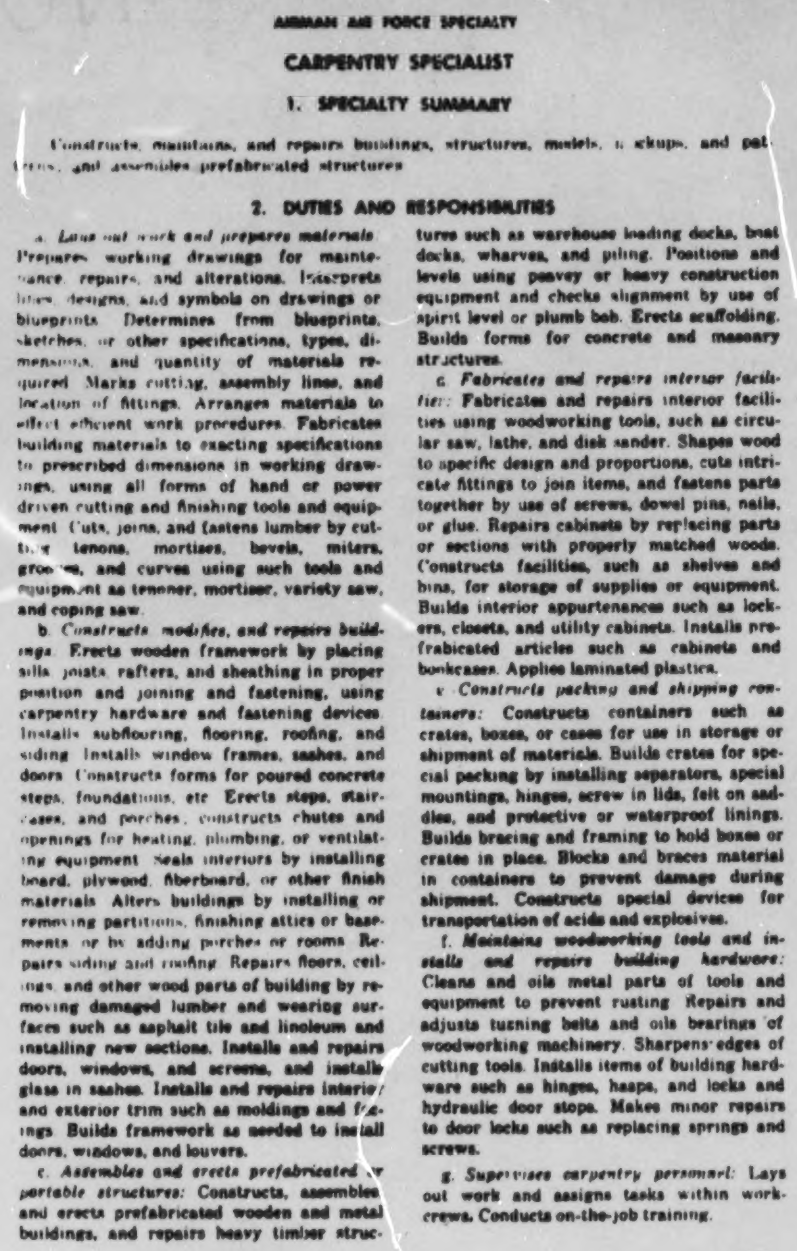

PAVEMENTS AND CONSTRUCTION EQUIPMENT SUPERINTENDENT
STRUCTURAL SUPERINTENDENT
SITE DEVELOPMENT SUPERINTENDENT
REAL ESTATE-COST-MANAGEMENT ANALYSIS SUPERINTENDENT
PROGRAMS AND WORK CONTROL SUPT
PAVEMENTS MAINTENANCE TECHNICIAN
CONSTRUCTION EQUIPMENT TECHNICIAN
STRUCTURAL TECHNICIAN
PROTECTIVE COATING TECHNICIAN
PLUMBING TECHNICIAN
SITE DEVELOPMENT TECHNICIAN
REAL ESTATE-COST-MANAGEMENT ANALYSIS TECHNICIAN
PROGRAMS AND WORK CONTROL TECHNICIAN
ADVANCED CORROSION CONT COURSE
ADVANCED PLUMBING COURSE
PROGRAMS AND WORK CONTROL SPECIALIST
PAVEMENTS MAINTENANCE SPECIALIST
CONSTRUCTION EQUIPMENT OPERATOR
CARPENTRY SPECIALIST
MASONRY SPECIALIST
PROTECTIVE COATING SPECIALIST
PLUMBING SPECIALIST
SITE DEVELOPMENT SPECIALIST
REAL ESTATE-COST-MANAGEMENT ANALYSIS SPECIALIST
APP PAVEMENTS MAINTENANCE SPECIALIST
APP CONST EQUIP OPERATOR
APP CARPENTER
APP MASON
APP PROTECTIVE COATER
APPRENTICE PLUMBER
APP SITE DEVELOPER
APP REAL ESTATE-COST-MANAGEMENT ANALYSIS SPECIALIST
AFSC
BASIC PAVEMENT & SOILS COURSE
BASIC CONST EQUIP COURSE
BASIC CARPENTRY COURSE
BASIC MASONRY COURSE
BASIC CORROSION CONT COURSE
BASIC PLUMBING COURSE
BASIC SURVEYOR OR DRAFTSMAN COURSE
BASIC REAL ESTATE OR ACCOUNTING COURSE
PROGRAMS AND WORK CONTROL COURSE
INPUT FROM ANY 5 LEVEL AFSC FROM 54, 55, OR 56 CF
STRUCTURAL & PAVEMENTS HELPER
AFSC 55010
BASIC AIRMAN
AFSC 99000
LEGEND FOR TRAINING COURSES
DESIRABLE
MANDATORY
CA-015
AIRMAN CIVIL ENGINEERING STRUCTURAL PAVEMENTS CAREER FIELD CHART

Figure 4. Airman Civil Engineering Structural/Pavements Career Field Chart



AIRMAN AIR FORCE SPECIALTY

CARPENTRY SPECIALIST

1. SPECIALTY SUMMARY

Constructs, maintains, and repairs buildings, structures, models, mockups, and patterns, and assembles prefabricated structures.

2. DUTIES AND RESPONSIBILITIES

a. *Lays out work and prepares materials:* Prepares working drawings for maintenance, repairs, and alterations. Interprets lines, designs, and symbols on drawings or blueprints. Determines from blueprints, sketches, or other specifications, types, dimensions, and quantity of materials required. Marks cutting, assembly lines, and location of fittings. Arranges materials to effect efficient work procedures. Fabricates building materials to exacting specifications to prescribed dimensions in working drawings, using all forms of hand or power driven cutting and finishing tools and equipment. Cuts, joins, and fastens lumber by cutting tenons, mortises, bevels, miters, grooves, and curves using such tools and equipment as tenoner, mortiser, variety saw, and coping saw.

b. *Constructs, modifies, and repairs buildings:* Erects wooden framework by placing sills, joists, rafters, and sheathing in proper position and joining and fastening, using carpentry hardware and fastening devices. Installs subflooring, flooring, roofing, and siding. Installs window frames, sashes, and doors. Constructs forms for poured concrete steps, foundations, etc. Erects steps, staircases, and porches; constructs chutes and openings for heating, plumbing, or ventilating equipment. Seals interiors by installing board, plywood, fiberboard, or other finish materials. Alters buildings by installing or removing partitions, finishing attics or basements, or by adding porches or rooms. Repairs siding and roofing. Repairs floors, ceilings, and other wood parts of building by removing damaged lumber and wearing surfaces such as asphalt tile and linoleum and installing new sections. Installs and repairs doors, windows, and screens, and installs glass in sashes. Installs and repairs interior and exterior trim such as moldings and facings. Builds framework as needed to install doors, windows, and louvers.

c. *Assembles and erects prefabricated or portable structures:* Constructs, assembles, and erects prefabricated wooden and metal buildings, and repairs heavy timber structures such as warehouse loading docks, boat docks, wharves, and piling. Positions and levels using peavey or heavy construction equipment and checks alignment by use of spirit level or plumb bob. Erects scaffolding. Builds forms for concrete and masonry structures.

d. *Fabricates and repairs interior facilities:* Fabricates and repairs interior facilities using woodworking tools, such as circular saw, lathe, and disk sander. Shapes wood to specific design and proportions, cuts intricate fittings to join items, and fastens parts together by use of screws, dowel pins, nails, or glue. Repairs cabinets by replacing parts or sections with properly matched woods. Constructs facilities, such as shelves and bins, for storage of supplies or equipment. Builds interior appurtenances such as lockers, closets, and utility cabinets. Installs prefabricated articles such as cabinets and bookcases. Applies laminated plastics.

e. *Constructs packing and shipping containers:* Constructs containers such as crates, boxes, or cases for use in storage or shipment of materials. Builds crates for special packing by installing separators, special mountings, hinges, screw in lids, felt on saddles, and protective or waterproof linings. Builds bracing and framing to hold boxes or crates in place. Blocks and braces material in containers to prevent damage during shipment. Constructs special devices for transportation of acids and explosives.

f. *Maintains woodworking tools and installs and repairs building hardware:* Cleans and oils metal parts of tools and equipment to prevent rusting. Repairs and adjusts turning belts and oils bearings of woodworking machinery. Sharpens edges of cutting tools. Installs items of building hardware such as hinges, hasps, and locks and hydraulic door stops. Makes minor repairs to door locks such as replacing springs and screws.

g. *Supervises carpentry personnel:* Lays out work and assigns tasks within workcrews. Conducts on-the-job training.

[illegible]

Figure 5

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SUMMARY

The Civil Engineer organization has the responsiblity of operating and maintaining all real property. We, who are part of Air Force Civil Engineers, must be aware of the tremendous costs involved. We must do all we can to conserve dollars and make our labor economical for the operation and maintenance of this real property.

If we work hard, study and do our best, we can expect to climb up the career field ladder from a 99000 to perhaps a 55295.

QUESTIONS

1. Name as many jobs as you can that the BCE does?
2. What is real property?
3. Using the organizational chart in figure 1, the Carpentry Area is directly responsible to what section?
4. Sewage plants and systems are under what section of the BCE organization?
5. What is the purpose of the Air Force Specialty Code?
6. What are the main tasks of a Carpentry Specialist?

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BASE CIVIL ENGINEER ORGANIZATION AND CAREER FIELD ORIENTATION

OBJECTIVE

When you have completed this workbook you will be able to:

Trace the chain of command from the base civil engineer to the carpentry shop on a base civil engineering organizational chart.

Trace the progression of a structural/pavements helper through the carpentry ladder to the structural superintendent on a career field chart.

List four tasks from each section in a carpentry job description.

EQUIPMENT

	Basis of Issue
SG 3ABR55230-I-2	1/student
WB 3ABR55230-I-2-P1	1/student

PROCEDURE

Mission 1

1. Use a red pencil and trace the chain of command from the base civil engineer to the carpentry shop on figure 6.

2. Explain why the work control section is not in the chain of command.

____

____

____

3. Why is the word "structural" used instead of "carpentry" to designate the carpentry shop? ____

____

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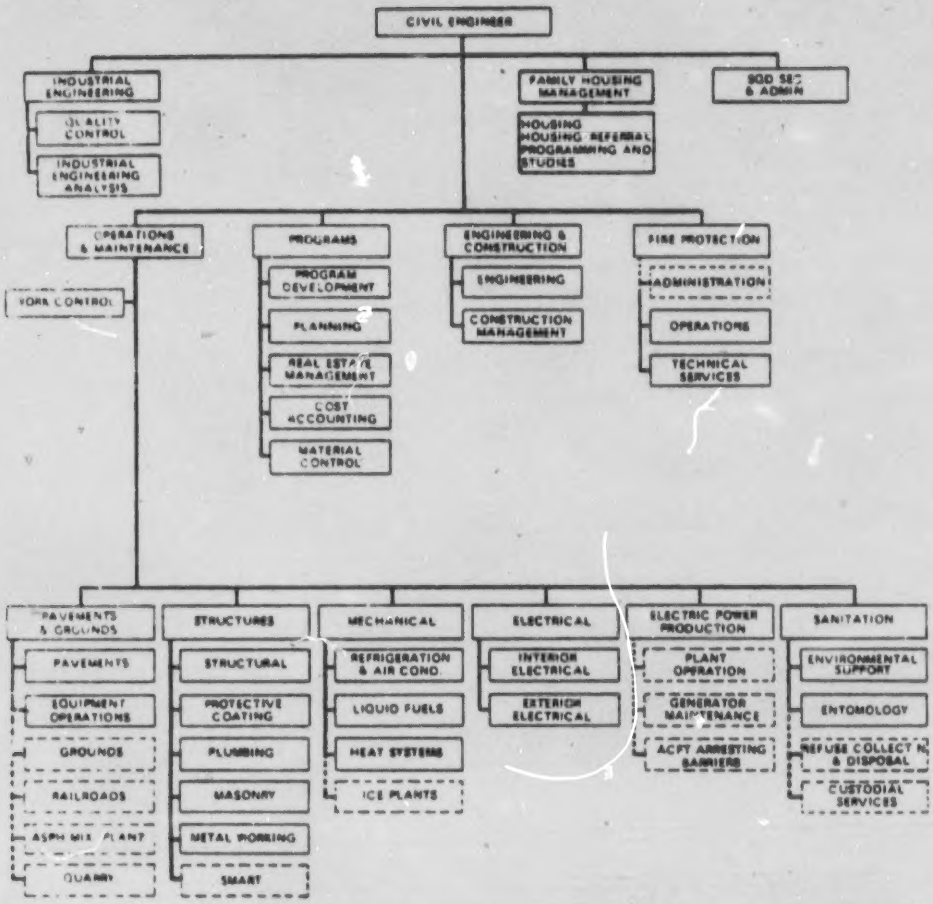
CIVIL ENGINEER
INDUSTRIAL ENGINEERING
QUALITY CONTROL
INDUSTRIAL ENGINEERING ANALYSIS
FAMILY HOUSING MANAGEMENT
HOUSING
HOUSING REFERRAL
PROGRAMMING AND STUDIES
SQD SEC & ADMIN
OPERATIONS & MAINTENANCE
WORK CONTROL
PROGRAMS
PROGRAM DEVELOPMENT
PLANNING
REAL ESTATE MANAGEMENT
COST ACCOUNTING
MATERIAL CONTROL
ENGINEERING & CONSTRUCTION
ENGINEERING
CONSTRUCTION MANAGEMENT
FIRE PROTECTION
ADMINISTRATION
OPERATIONS
TECHNICAL SERVICES
PAVEMENTS & GROUNDS
PAVEMENTS
EQUIPMENT OPERATIONS
GROUNDS
RAILROADS
ASPH MIX PLANT
QUARRY
STRUCTURES
STRUCTURAL
PROTECTIVE COATING
PLUMBING
MASONRY
METAL WORKING
SMART
MECHANICAL
REFRIGERATION & AIR COND.
LIQUID FUELS
HEAT SYSTEMS
ICE PLANTS
ELECTRICAL
INTERIOR ELECTRICAL
EXTERIOR ELECTRICAL
ELECTRIC POWER PRODUCTION
PLANT OPERATION
GENERATOR MAINTENANCE
ACFT ARRESTING BARRIERS
SANITATION
ENVIRONMENTAL SUPPORT
ENTOMOLOGY
REFUSE COLLECT N & DISPOSAL
CUSTODIAL SERVICES

NOTE 1 SEE AFM 26–2 AND AFR 85–5 FOR STANDARD ORGANIZATIONAL STRUCTURE AND POLICY

2 THIS CHART SUPPLEMENTS AFM 26–2 AND ILLUSTRATES THE PREFERRED ORGANIZATIONAL PLACEMENT FOR SOME SUBFUNCTIONS THAT MAY BE REQUIRED AT MAJOR INSTALLATIONS. SEPARATE IDENTIFICATION OF FUNCTIONAL ELEMENTS IS FOR PURPOSES SUCH AS CLARITY AND UNDERSTANDING. IT IS NOT INTENDED TO ESTABLISH A REQUIREMENT FOR INDIVIDUAL WORK CENTERS.

3 INDIVIDUAL TOTAL MAINTENANCE CENTERS (E. G., FAMILY HOUSING, MEDICAL FACILITIES, ETC.) ARE NOT ILLUSTRATED. MAJOR COMMANDS HAVE THE OPTION OF ESTABLISHING SUCH CENTERS WITH THE CENTER SUPERVISORS REPORTING DIRECTLY TO THE CHIEF OF O&M. ECONOMICS OF OPERATION OR CONSIDERATION OF NUMBERS OF PERSONNEL INVOLVED ARE BASIC DETERMINING FACTORS.

4 ORGANIZATIONAL SUBELEMENTS WITHIN MAJOR FUNCTIONAL AREAS MAY BE VERTICALLY EXPANDED OR CONTRACTED WHERE ECONOMICAL AND/OR OPERATIONAL CONSIDERATIONS DICTATE, WITH APPROVAL BY MAJOR COMMAND.

5 STRUCTURAL MAINTENANCE AND REPAIR TEAM (SMART) WILL BE MANNED FROM EXISTING WORK CENTER RESOURCES SINCE WORK LOAD AND MANNING STANDARDS (AFM 26–3) ARE BASED UPON SPECIFIC WORK CENTER REQUIREMENTS. THESE WORK LOAD REQUIREMENTS ARE COMBINED FOR SMART OPERATIONS, COSTING, PERSONNEL, AND ORGANIZATIONAL PLACEMENT PURPOSES.

CA–014A

Figure 6. Civil Engineering Organizational Chart

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Mission 2

1. Use the career field chart in figure 7 to trace the progression of a structural and pavements helper through the carpentry ladder to the structural superintendent.

2. Fill in the AFSC for each of the following skill levels:

a. Basic Airman ________

b. Structural and Pavements Helper ________

c. Apprentice Carpenter ________

d. Carpentry Specialist ________

e. Structural Technician ________

f. Structural Superintendent ________

3. Name the two career ladders that a person may go through to become a structural technician.

a. ____________________

b. ____________________

4. Name the three technicians that could become structural superintendents.

a. ____________________

b. ____________________

c. ____________________

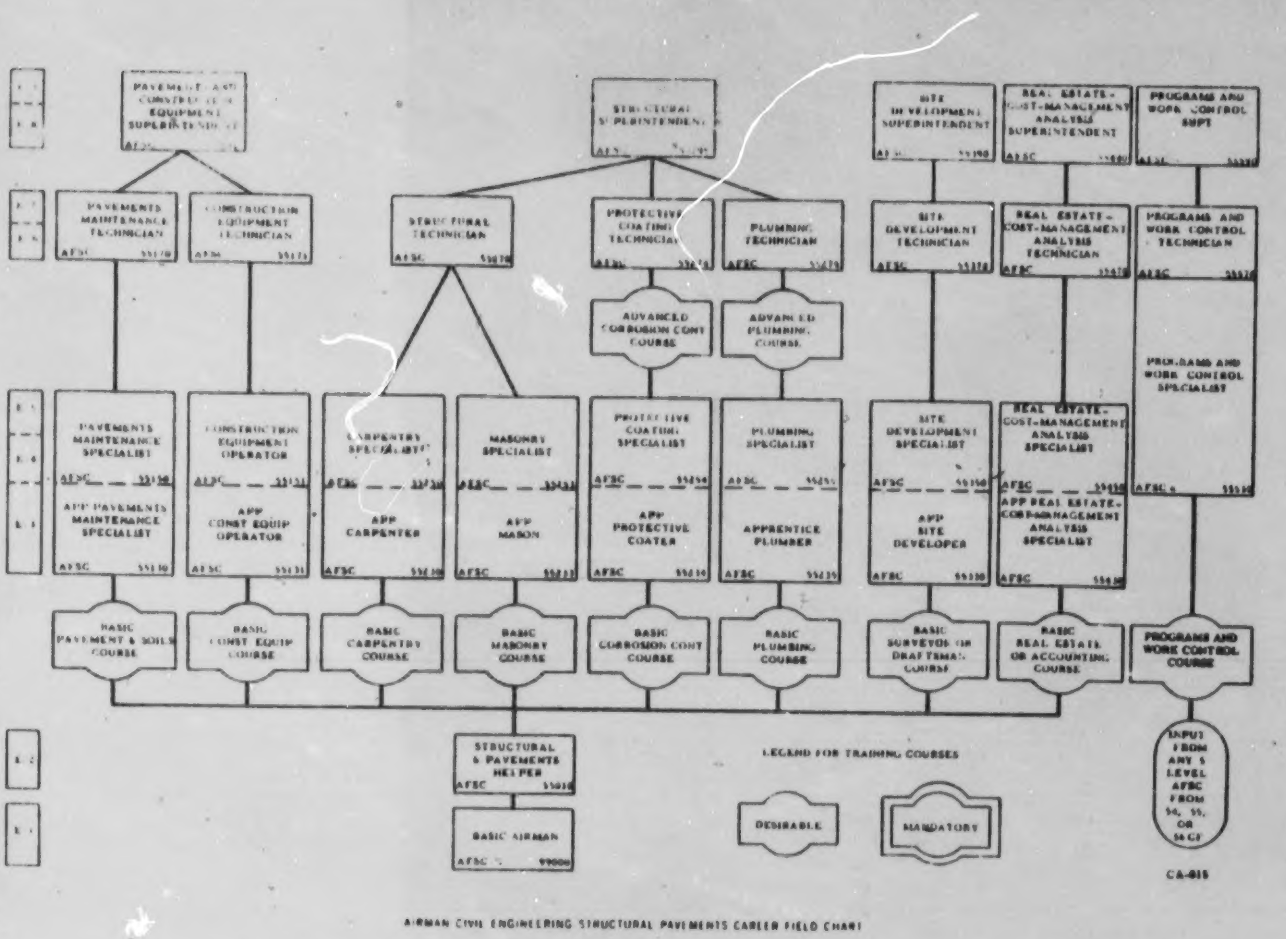
PAVEMENTS AND CONSTRUCTION EQUIPMENT SUPERINTENDENT
STRUCTURAL SUPERINTENDENT
SITE DEVELOPMENT SUPERINTENDENT
AFSC 55190
REAL ESTATE-COST-MANAGEMENT ANALYSIS SUPERINTENDENT
AFSC
PROGRAMS AND WORK CONTROL SUPT
PAVEMENTS MAINTENANCE TECHNICIAN
AFSC 55170
CONSTRUCTION EQUIPMENT TECHNICIAN
AFSC 55171
STRUCTURAL TECHNICIAN
AFSC 55270
PROTECTIVE COATING TECHNICIAN
AFSC
PLUMBING TECHNICIAN
AFSC 55275
SITE DEVELOPMENT TECHNICIAN
AFSC 55370
REAL ESTATE-COST-MANAGEMENT ANALYSIS TECHNICIAN
AFSC 55470
PROGRAMS AND WORK CONTROL TECHNICIAN
AFSC
ADVANCED CORROSION CONT COURSE
ADVANCED PLUMBING COURSE
PROGRAMS AND WORK CONTROL SPECIALIST
PAVEMENTS MAINTENANCE SPECIALIST
AFSC 55150
APP PAVEMENTS MAINTENANCE SPECIALIST
AFSC 55130
CONSTRUCTION EQUIPMENT OPERATOR
AFSC 55151
APP CONST EQUIP OPERATOR
AFSC 55131
CARPENTRY SPECIALIST
AFSC 55250
APP CARPENTER
AFSC 55230
MASONRY SPECIALIST
AFSC
APP MASON
AFSC
PROTECTIVE COATING SPECIALIST
AFSC 55254
APP PROTECTIVE COATER
AFSC 55234
PLUMBING SPECIALIST
AFSC 55255
APPRENTICE PLUMBER
AFSC 55235
SITE DEVELOPMENT SPECIALIST
AFSC 55350
APP SITE DEVELOPER
AFSC 55330
REAL ESTATE-COST-MANAGEMENT ANALYSIS SPECIALIST
AFSC 55450
APP REAL ESTATE-COST-MANAGEMENT ANALYSIS SPECIALIST
AFSC
AFSC 55550
BASIC PAVEMENT & SOILS COURSE
BASIC CONST EQUIP COURSE
BASIC CARPENTRY COURSE
BASIC MASONRY COURSE
BASIC CORROSION CONT COURSE
BASIC PLUMBING COURSE
BASIC SURVEYOR OR DRAFTSMAN COURSE
BASIC REAL ESTATE OR ACCOUNTING COURSE
PROGRAMS AND WORK CONTROL COURSE
INPUT FROM ANY 5 LEVEL AFSC FROM 54, 55, OR 56 GP
STRUCTURAL & PAVEMENTS HELPER
AFSC 55010
BASIC AIRMAN
AFSC 99000
LEGEND FOR TRAINING COURSES
DESIRABLE
MANDATORY
CA-015
AIRMAN CIVIL ENGINEERING STRUCTURAL PAVEMENTS CAREER FIELD CHART

Figure 7. Airman Civil Engineering Structural/Pavements Career Field Chart

Mission 3

List four tasks from each section in the carpentry job description printed in study guide 3ABR55230-I-2, Base Civil Engineer Organization and Career Field Orientation.

SAFETY

OBJECTIVE

You should be able to identify and demonstrate proper safety practices related to the carpentry career field.

EQUIPMENT

	Basis of Issue
WB 3ABR55230-I-3-P1	1/student

Mission 1

OBJECTIVE

Given pictures containing safety hazards that may be encountered when using or maintaining carpenter tools and equipment, identify these hazards and explain how to eliminate them.

340

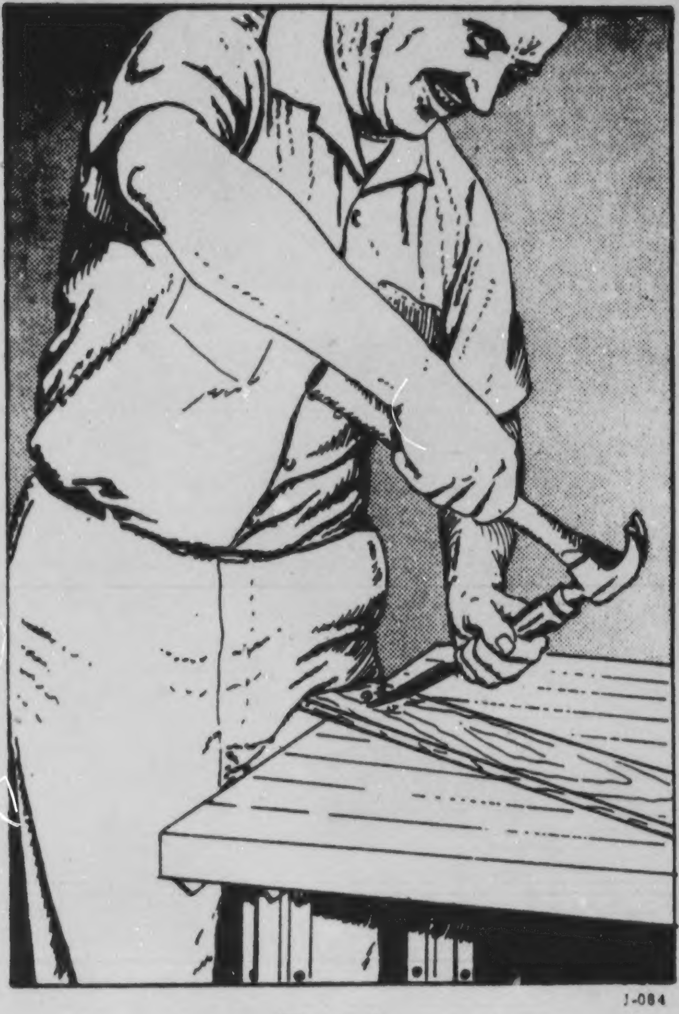
J-084

Figure 8

Hazard s: ______________________________

____

Procedures for elimination: ______________________________

____

____

____

317

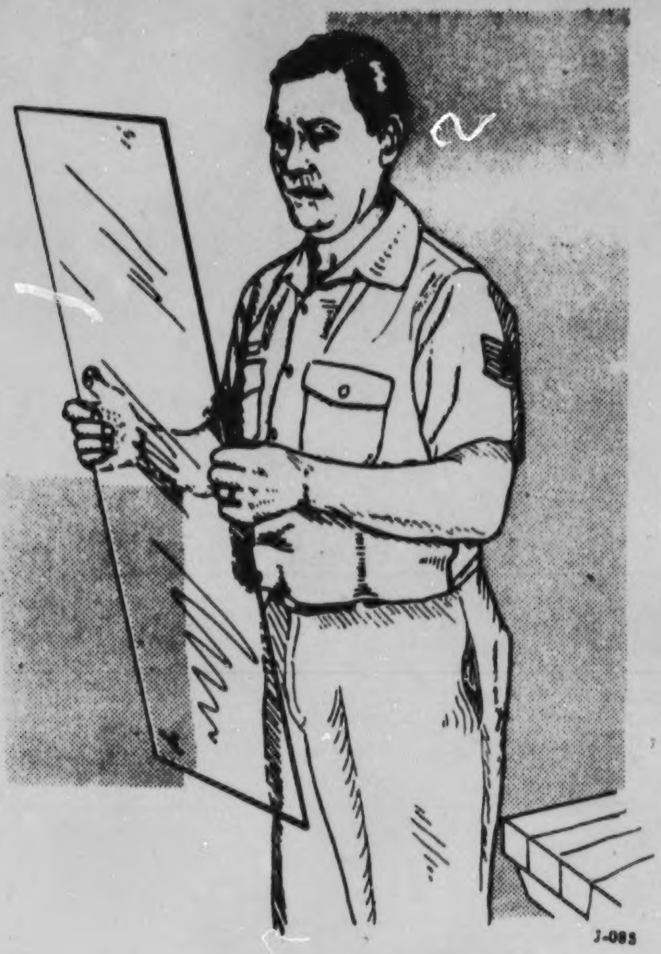

Figure 9

Hazard/s:

Procedures for elimination:

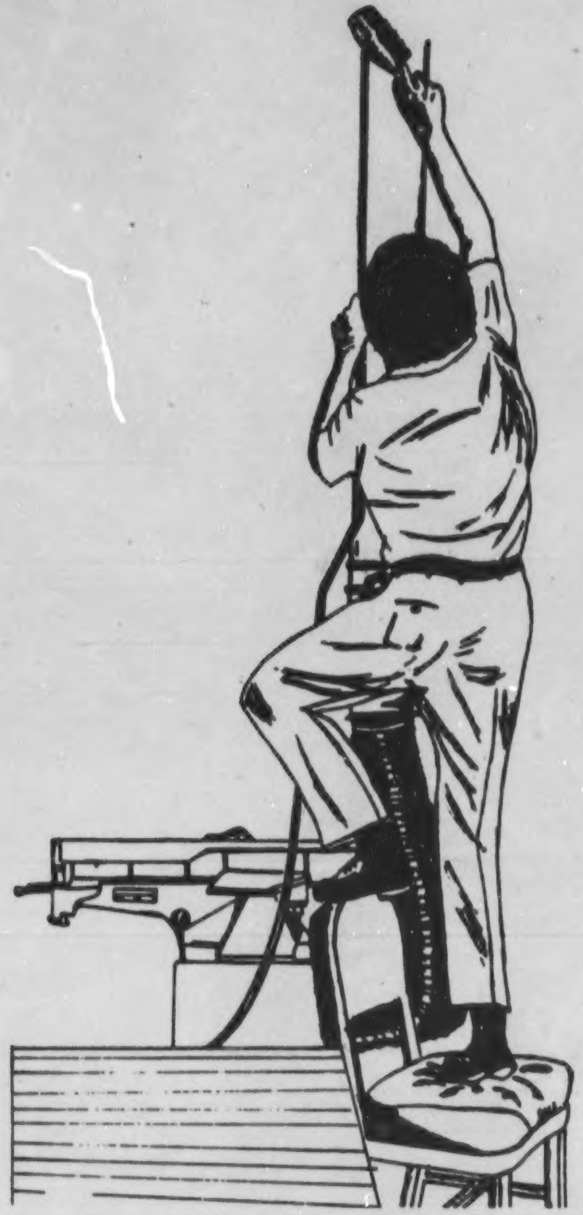

Figure 10

Hazard/s: ______________________________

____

Procedures for elimination: ______________________________

____

____

343

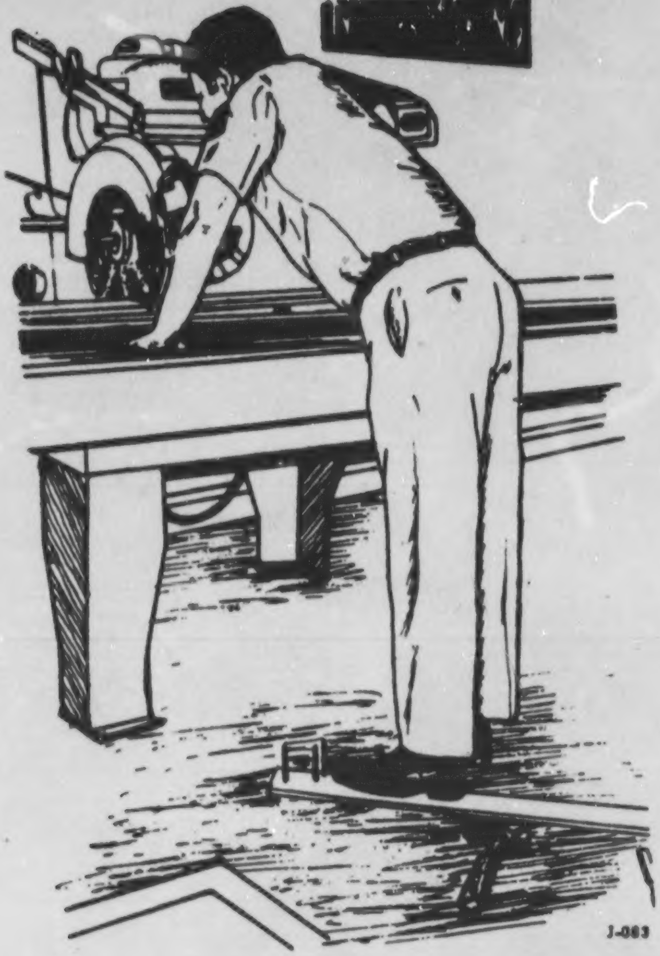

Figure 11

Hazard/s: ____

____

Procedures for elimination: ____

____

____

350

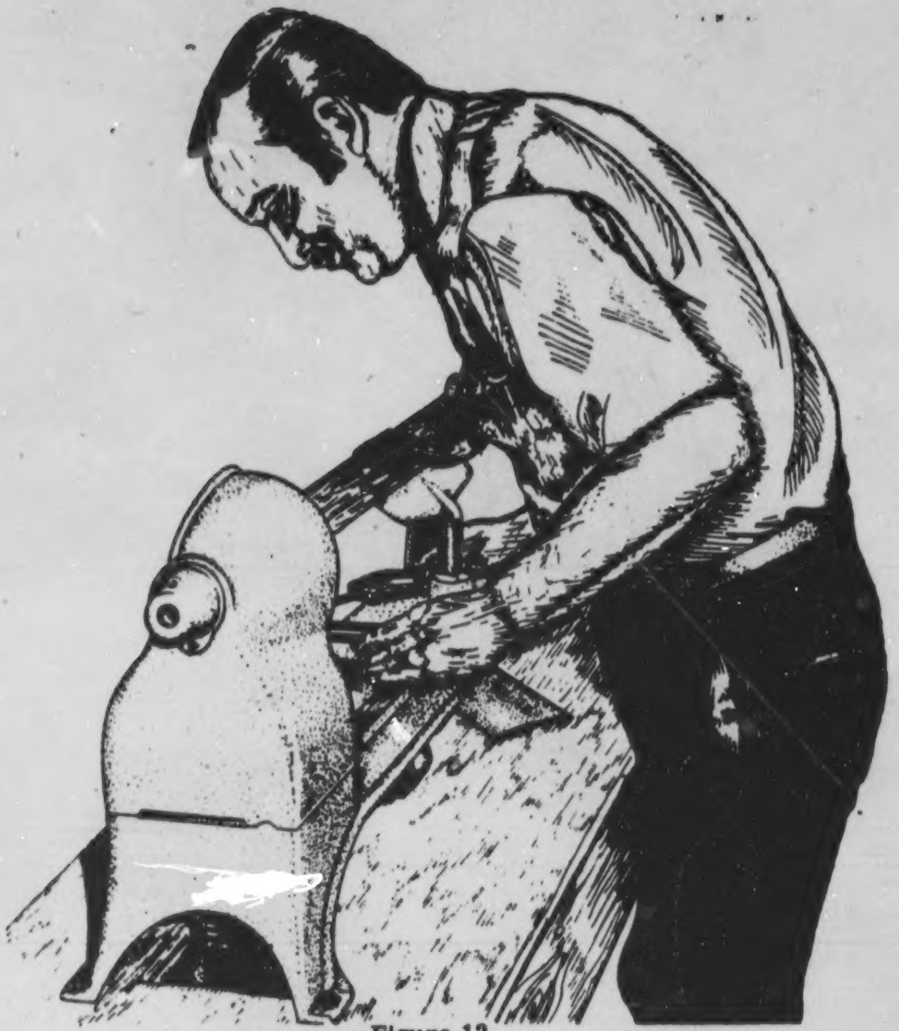

Figure 12

Hazard/s: ______________________________

____

Procedures for elimination: ______________________________

____

____

____

Mission 2

OBJECTIVE

Given pictures of body positions that could be used to lift a heavy load, select the position that should be used to prevent back injury.

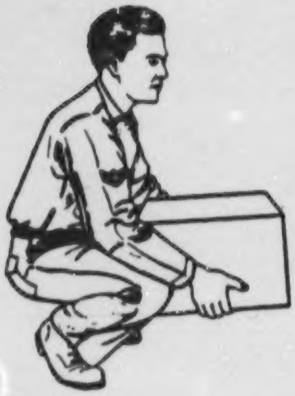

Figure 13. Correct/Incorrect

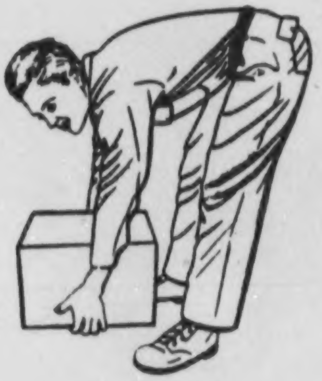

Figure 14. Correct/Incorrect

Mission 3

OBJECTIVE

Demonstrate the correct method of carrying a piece of material over 8-feet long

1. How should a piece of material over 8-feet long be carried in order to prevent injury to yourself or to others?

2. You will be required to demonstrate this when you go out into the shop.

Mission 4

OBJECTIVE

Stack various lengths of lumber so that the finished stack will not be a safety hazard.

1. Explain how several piecss of lumber of various lengths should be stacked so that the finished stack will not be a safety hazard.

____

____

____

____

2. You will be required to demonstrate this when you go out into the shop.

PROJECT AND RESOURCE MANAGEMENT

OBJECTIVES

Upon completion of this workbook you will be able to:

Identify who has responsibility for initiating AF Form 332, Work Request.

Identify work authorization documents that the apprentice carpenter uses.

Ascertain that authorized equipment for the carpentry shop is listed in TA-467.

Locate and identify stock numbers and standard nomenclature of equipment and supplies using a GSA catalog.

Define custodial responsibility and pecuniary liability.

Identify by color the three types of equipment condition tags.

EQUIPMENT

	Basis of Issue
Study Guide AFS 55, 56	1/student
WB 3ABR55230-I-4-P1	1/student

Complete the following exercises by filling th the blank spaces using study guide AFS 55, 56 Project and Resource Management.

Mission 1

1. Two inputs to the Civil Engineer's work plan that the shop foreman is responsible for making is ____________________ and _______________ ____________________.

2. All work inputs are made to the ________________ _________________ who in turn places the man-hours on the in work service plan.

3. _____________ ______________ office heads the evaluation section for Civil Engineering.

4. Each year a team known as the __________________ travels to each building on the base and thoroughly inspects them for work that needs to be accomplished.

5. The name used to identify our automated data processing system in Civil Engineering is _________________________.

Mission 2

1. The form number of the Civil Engineering work request is ______________.

2. AF Form 332 is used for approval of in-service minor construction over ________________ dollars for military family housing.

3. For additional information on the work request, you would consult Air Force Manual ______________.

Mission 3

1 AF Form ______________ is used to authorize work of a minor nature with a minimum of administrative cost.

2 The HOPPER job order should be completed in ______________ days.

3. The form for SMART job orders is __________________.

4. ______________ is the AF Form number for Base Civil Engineering work order.

Mission 4

1. After the craftsman has completed his first job assignment of the day, he calls the ________________ responsible for recording the man-hours.

2. The controller records daily man-hours on AF Form number ____________.

3. The weekly assignment of work to each Civil Engineering shop is the responsibility of the ____________ ____________ ______________.

Mission 5

1. __________ ____________ prepares the AF Form 1445 for work orders requiring materials.

2. When transferring materials in a nonautomated system, you would use AF Form ________________________.

3. When transferring materials in the BEAMS system you would use AF Form ____________________.

Mission 6

1. The table of allowance for the base carpenter shop is listed in TA ________.

2. If you were in a shop of more than ten carpenters you would refer to column ________ for the quantity of issue.

Mission 7

1. The General Services Administration stock catalog is divided into ________ ________ books and each book into ________ basic sections.

2. Using figures 21 and 22 in study guide AFS 55, 56, locate and list a bit auger 7/8" using proper nomenclature and stock number ____

3. The Air Force is a large organization and has much valuable property. Personnel of the Air Force are responsible for its use and protection. If you use a piece of equipment, you are personnally responsible for its proper use and care. The person to whom the equipment is assigned is the custodian and is responsible for its upkeep and security. The person responsible for keeping up with equipment assigned has ________________ responsibility.

4. Equipment and supplies are issued as a result of a request. Three forms, which are requests, are listed. Match the form with the correct example of the equipment or materials that would be requisitioned on that form by drawing a line from the form number to the example.

a. AF Form 601B, Custodian Request/Receipt, request for handtools.

b. AF Form 1445, Materials and Equipment List, request for table saw authorized in TA 467.

c. AF Form 1801, Request for Issue or Turn-In, request for lumber to repair steps.

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Mission 8

1. Tools and equipment are inspected periodically to determine their condition as to usefulness and safety. If the tool is found to be in safe operating condition and good mechanically, it is tagged with a Yellow or Serviceable Tag. Tools requiring repair but economically reparable are tagged with a Green Tag. Items not serviceable, and whose repair would not be economically feasible are tagged with a Red Tag which indicates that the item is condemned. Match the condition of the items listed with the proper tag by drawing a line from the item to the tag.

a. DD Form 1574 (Yellow Tag), a portable electric saw is in good condttion.

b. DD Form 1577-2 (Green Tag), a portable electric saw works properly, but insulation on the power cord is frayed.

c. DD Form (Red Tag). the guard, handle, and motor housing of a portable electric saw are broken. The motor runs slowly and smokes.

2. Most of the supplies issued as a carpenter will be issued on an AF Form 1445, Materials and Equipment List. What should you do if you note discrepancies as to quantity or quality of materials issued to you? Remember the chain of command? You should report these material deficiencies to your ______________________ supervisor. Always check the quantity of items delivered against the quantity shown on the issue form before signing for materials.

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SHOP MATH

OBJECTIVE

To present a review of simple math as used in the carpentry field

INTRODUCTION

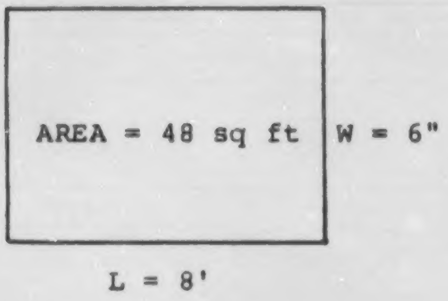
In this course, you will be measuring lumber. Most measurements will be in feet, inches, and fractions of an inch.

Square

Much carpenter work is estimated on square footage of material. A square foot is the area that is one-foot long and one-foot wide. An area that is one-foot wide and two-feet long contains two square feet.

Square feet of an area can be found by multiplying length times width. How many square feet are there in an area 6-feet wide and 8-feet long?

Your answer should always contain an abbreviation of the type of measure you are using. For instance, in the problem above, 6 feet by 8 feet, the answer is 48 but now we must also include the abbreviation sq ft which means square feet. Your answer should be 48 sq ft.



L x W = AREA in square measure

Computing Board Feet

It is standard procedure in the field of carpentry that all lumber is bought or sold by the board foot.

DEFINITION. The definition of a board foot is any piece of material that is 1" x 12" x 12". Any material that has a thickness of less than 1" should be considered to the next highest inch. There are no fractions used in thickness, width, or length when computing board feet.

FORMULA. The formula for computing board feet is: Thickness x width x length over 12 equals board feet.

Example:

$$\frac{2'' \times 4'' \times 16'}{12} = 10\ 2/3 \text{ board feet}$$

To figure the amount of board feet in a stack of lumber, multiply the number of pieces times the total board feet in one board.

Lumber is often sold by the thousand board feet. The symbol for a thousand board feet is Ⓜ.

To compute the price of lumber, you first find the number of board feet in a piece of lumber, as shown in the previous example, then multiply it by the price of one board foot. Let's say lumber is 15 cents a board foot. Multiply the 10 2/3 times 15¢.

Example:

$$10\ 2/3 \times 0.15 = \$1.60$$

or using the formula

$$\frac{2'' \times 4'' \times 16' \times .15}{12} = \$1.60$$

SUMMARY

Although the mathematics involved with carpentry is not complex, it is, however, extremely important. You must be able to determine how much material is needed for a job, and sometimes, the cost of that material. As with most difficult subjects, the more you practice the better you will get.

QUESTIONS

1. How could you determine the number of square feet of a floor that is 6' by 8'?
2. What is the measurement of one board foot?
3. If a piece of material measures 3/4 inch in thickness how will this be used in computing a board foot?
4. How many board feet are there in a 2 x 4 that is 12-feet long?
5. At 15 cents per BF, how much will the board cost in question 4?

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MATHEMATICS

OBJECTIVE

When you have completed this workbook you will be able to compute areas of squares and rectangles, the number of board feet in items of building material, and the cost of the materials.

EQUIPMENT

	Basis of Issue
WB 3ABR55230-I-5-P1	1/student

Mission 1

Work the following area problems, using the prescribed formula.

The formula for Area of a Square or Rectangle:

Length times Width

L x W

1. Find the area of a floor of a building measuring 45' x 35'.

2. What is the area of a room 12' x 18'?

3. How many square inches are in a piece of floor tile 9" x 9"?

4. Carpet is measured by square yards. How many square yards of carpet would it take to cover a floor 35' x 60'?

5. To paint a wall you must know how many square feet are in the wall. Find the number of square feet in a wall 8' x 10' 6".

6. How many square inches are in a table top 26' x 62"?

7. You are to cover a wall 10' x 25' with wall paper. How many square yards will it take?

8. One box of floor tile measuring 12" x 12" will cover 40 square feet. How many boxes will it take to cover a floor 60' x 80'?

Mission 2

The formula for Board Feet is thickness times width times length divided by 12. The reason for dividing by 12 is because we are measuring a foot and 12 inches is one foot.

$$\text{Formula: } \frac{T \times W \times L}{12}$$

NOTE: Cancellation may be used to reduce numbers.

Work the following problems:

1. How many board feet are there in a piece of lumber 1 inch thick, 12 inches wide, and 48 inches long?

2. How many board feet are there in a piece of lumber 1 inch thick, 12 inches wide, and 8 feet long?

3. How many board feet are there in each of the following pieces of lumber?

1" x 6" x 8"
1" x 4" x 12'
1" x 2" x 8'
1" x 6" x 12'
1" x 3" x 8"
1" x 4" x 10'
2" x 12" x 4'
3" x 12" x 8'
4" x 12" x 10'

Mission 3

The carpenter must also figure the number of Board Feet in many pieces of lumber that have the same size. This is done by simply multiplying thickness times width times length times the number of pieces, divided by 12.

$$\text{Formula: } \frac{T \times W \times L \times \#\text{pcs.}}{12}$$

Work the following problems:

1. How many board feet are in 6 pieces of lumber which is 2" thick, 4" wide and 3' long?

2. How many board feet are in 12 pieces of lumber with these dimensions: 2" x 4" x 6'?

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3. How many board feet are in each of the following orders of lumber?

120 pieces of 2" x 6" x 4'
85 pieces of 3" x 4" x 10'
190 pieces of 2" x 6" x 10'

Mission 4

As a builder you must be able to figure how much it is going to cost to build many things.

All lumber is sold by the Board Foot, and the price is figured for one thousand Board Feet.

The formula for figuring the cost of lumber is based on the price of one thousand board feet (the symbol used for one thousand bd. ft. is Ⓜ). By moving the decimal point to the left three places, you have the price of one Board Foot.

Formula: $$\frac{T \times W \times L \times \#\text{pcs.} \times \text{cost per } \textcircled{M}}{12}$$

Work the following problems to find the cost:

1. 60 pieces of 4" x 6" x 8' at $100.00 per Ⓜ
2. 75 pieces of 2" x 9" x 10' at $110.00 per Ⓜ
3. 200 pieces of 2" x 10" x 15' at $117.00 per Ⓜ
4. 500 pieces of 2" x 12" x 10' at $800.00 per Ⓜ
5. 12 pieces of 4" x 4" x 12' at $950.00 per Ⓜ
6. 20 pieces of 1" x 6" x 8' at $50.00 per Ⓜ
7. 1,750 pieces of 2" x 4" x 6' at $120.00 per Ⓜ
8. 3,000 pieces of 1" x 9" x 12' at $90.00 per Ⓜ
9. 550 pieces of 2" x 12" x 10' at $200.00 per Ⓜ

USING STANDARD PUBLICATIONS

OBJECTIVE

When you have completed this workbook you will be able to locate TO numbers and titles, procedures for accomplishing a job, procedures for maintaining and reporting TO deficiencies, and the numbers and titles of standard publications.

EQUIPMENT

	Basis of Issue
WB 3ABR55230-I-6-P1	1/student

Mission 1

Complete the following exercises:

1. Technical Order 0-1-01, Numerical Index and Requirements Table, is referred to as the "Index of Indexes" because it lists different categories of Technical Order Indexes. Using TO 0-1-01, find the Index of Standard and Special Tools Technical Orders. This is TO________________ and lists many standard and special tools Technical Orders used by carpenters, and in carpenter shops.

2. Using the Table of Contents of TO 0-1-32, find the page that lists Standard and Special Tools Technical Orders.

3. Of the Standard and Special Tools Technical Orders, three are of special value to you as a carpenter. Write the TO number, or name beside the name or number listed.

   a. TO _______________, Maintenance and Care of Handtools.

   b. TO 32-1-151, ____

   c. TO _______________, Engineer Handtools.

4. Using the TOs 32-1-101, 32-1-151, or 32-1-171, locate the following information, and briefly record the information in the space provided.

   SUGGESTION: Using the Table of Contents will aid you in finding information in the TOs.

   a. How may abrasive wheels be checked for cracks? __________

   ____

   b. What type clamp uses a swivel? __________________________

c. How many points does a scriber have? __________________

d. What type of a handsaw has teeth that are shaped like chisels?

____

e. What is used to keep the slot from closing when ripping a board with a handsaw? ______________________________

f. How many teeth per inch should a hacksaw blade have for cutting thin-walled tubing or sheet metal thinner than 18 gage?

____

g. The ____________ of a claw hammer is the part that strikes the nail when the hammer is being used to drive nails.

h. ____________ _______ oil is used to preserve wooden parts of handtools.

i. The tip of a screwdriver should be _____________ and

____________.

j. What are the names of the three heads of a combination square?

__________, __________, and ______________

k. What is meant by jointing the teeth of handsaws? __________

____

5. Technical Orders sometime have errors that result in loss of man-hours or misuse of equipment. When these errors are found, they may be reported by initiation of AFTO Form ____________.

6. To aid you in filling out this form you may use TO ____________.

7. After you have initiated the form, to whom do you give it? ________

____

8. **Air Force Regulation 0-2, Numerical Index of Standard and Recurring Air Force Publications contains _________ sections. (Refer to AFR 0-2)**

9. **Symbols used are __________ for Regulations, __________ for Manuals, and __________ for Pamphlets.**

10. **"0" series of Regulations are ______________________________.**

11. **What is the title of AFM 39-1? ______________________________**

____

12. **What is the title of AFM 50-5? ______________________________**

____

HANDTOOLS

OBJECTIVE

When you have completed this unit of instruction you will be able to identify handtools as to their use, and you will be able to use, clean, oil, and store handtools.

ASSIGNMENT

Study unit 1, handtools, pages 9 through 22, in textbook, Modern Carpentry, and answer questions 1-10 at the end of the unit.

SUMMARY

The ease and accuracy with which a carpenter lays out his work depends upon his skill and training in the use of layout and measuring tools such as rules, squares, levels, plumb bobs, scribers, dividers, T-bevels and chalklines.

Supporting and holding tools are tools that can be made on the job by the carpenter such as the sawhorse, workbench, mitrebox and straightedge. Others, such as vises, hand screw and C-clamps are commercially manufactured items.

The principal types of saws used in the carpentry trade are: handsaws (both ripsaw and crosscut), the compass keyhole saws, coping saw, and hacksaw. Most manufacturers make saws in various grades, of either hard or soft steel, and in either regular lightweight models to suit individual needs.

All boring augers and drill bits, held by the brace, hand drill, and push-drill are known as boring tools. These tools include a variety of instruments used in one way or another in connection with boring holes.

Much of the carpenter's work consists of fastening building parts together with nails and screws. These tasks are accomplished with tools such as the clawhammer, nail set, mallet, sledgehammer, ball peen hammer, half hatchet, shingling hatchet, hand axe, punches and screwdrivers.

Carpenters need a specially designed paring tool to mortise wood for repair work and for all woodwork that requires a rugged general-purpose tool. This need is met by the various types of woodworking chisels.

Before rough sawn boards can be used for any finish work they must be worked with one of the shaving tools. This class includes the smoothing jack, jointer and block planes.

All items used for wearing down materials by friction or rubbing are known as abrading tools. This class includes sharpening stones, grinders, files and the abrasive papers, such as sandpaper and emery paper.

The scraping tools include paint scrapers in numerous shapes and wood scrapers used to smooth wood of any shape.

A wrench is a tool used to exert a twisting force on boltheads, nuts, and studs. This class includes socket sets with extensions and handles, box-end wrenches, open-end wrenches, adjustable jaw wrenches, and socket head setscrew wrenches.

The miscellaneous tool class includes nail pullers, wrecking bars, putty knives, bolt cutters, snips, and pliers.

HANDTOOLS

OBJECTIVES

When you have completed the missions in this workbook you will be able to:

1. Identify selected handtools.
2. Use, clean, oil, and store the following:
    a. Measuring and layout tools.
    b. Saws.
    c. Planing and shaping tools.
    d. Drilling and boring tools.
    e. Hammers.
    f. Screwdrivers.
    g. Clamping tools.

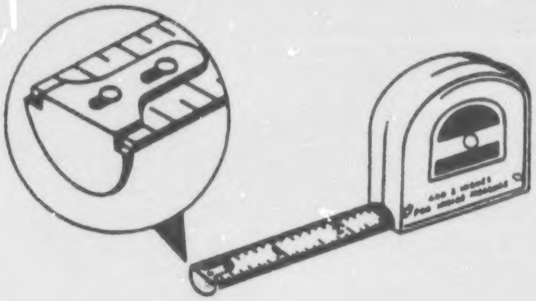
EQUIPMENT

	Basis of Issue
SW 3ABR55230-I-7	1/student
Measuring and Layout Tools	1/student
Saws	1/student
Planing and Shaping Tools	1/student
Drilling and Boring Tools	1/student
Hammers	1/student
Screwdrivers	1/student
Clamping Tools	1/student

Mission 1

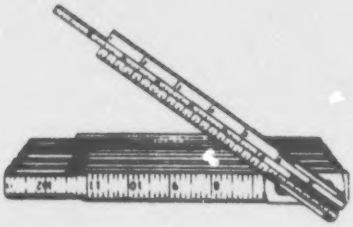
1. Identify the following measurement and layout tools by writing their names in the space provided, and completing the statement as to their use.

a.



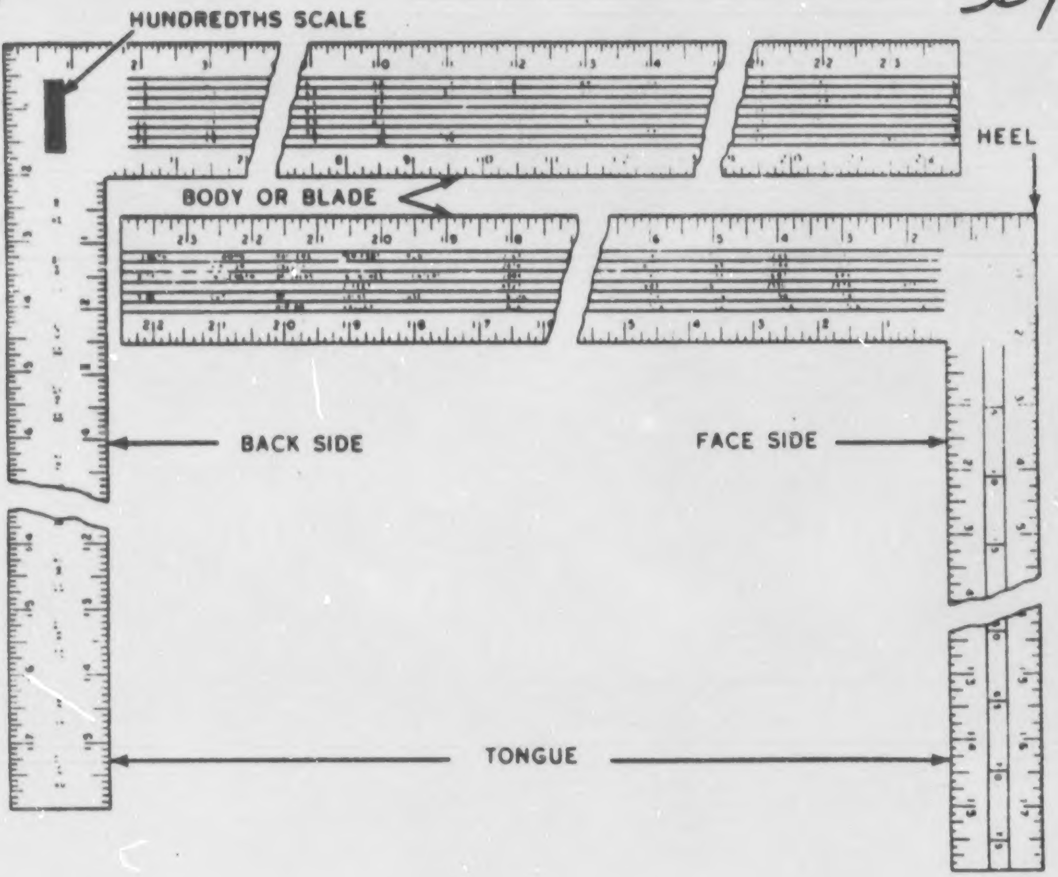
This device is a ____________________ rule, and is used for making ________________________________.

b.



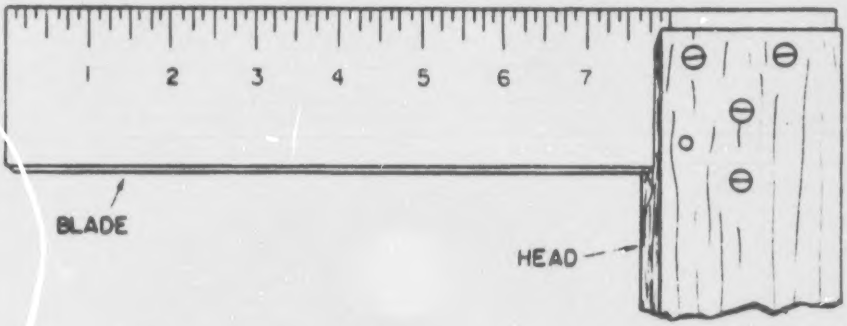
This is a ____________________ and is used for ______________ ____________________________.

c.


HUNDREDTHS SCALE
HEEL
BODY OR BLADE
BACK SIDE
FACE SIDE
TONGUE

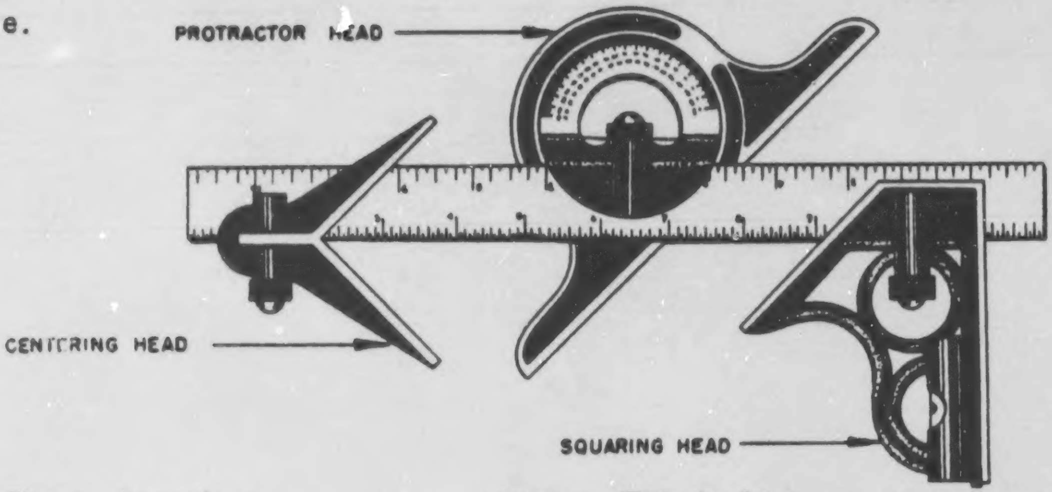
These are ________________ squares, and are used for ________________ angles, such as rafters, and ________________________________ stock.

d.


1
2
3
4
5
6
7
BLADE
HEAD

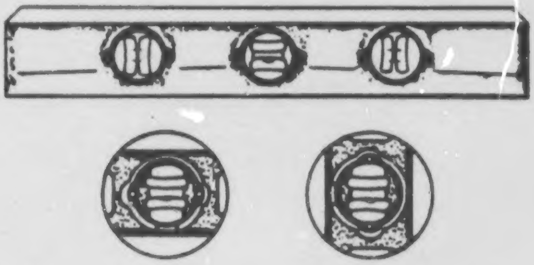
This is a ____________ square, and is used for ____________________.

e.


PROTRACTOR HEAD
CENTERING HEAD
SQUARING HEAD

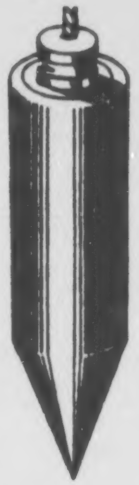
Shown above is a ____________square. This tool has many uses, such as marking__________________and______________________degree angles

f.



The tool shown here is a____________and is used for

__________________________________.

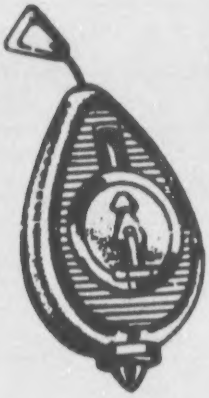


g.

Shown here is a _______________

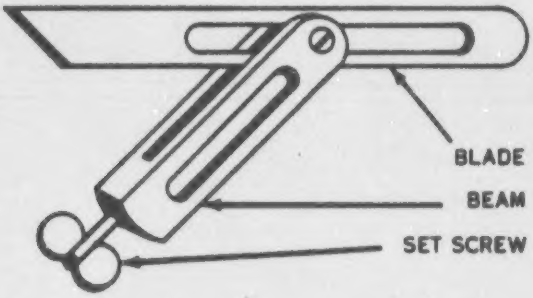
used for checking_______________ surfaces.

h.



This is a____________________reel which automatically applies chalk to the line.

i.


BLADE
BEAM
SET SCREW

The tool shown above is a________________________and is used for measuring and checking____________________________.

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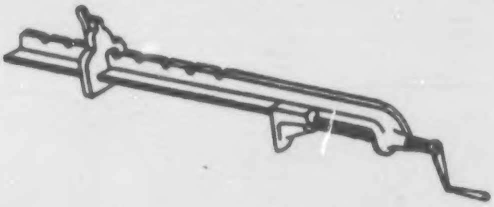
2. The following tools are supporting or holding tools. Identify them as to their name or use.

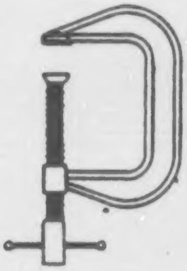
a.



This is a ________________ clamp, and may be used for

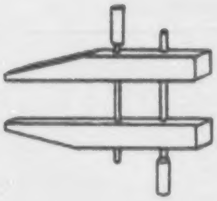
________________ stock together, or for holding ____________ for assembly.

b.



This is a ______________ clamp. These clamps are available in many sizes, and are used for __________________ and assembly.

c.



This is a __________ clamp, also used for glueing and __________.

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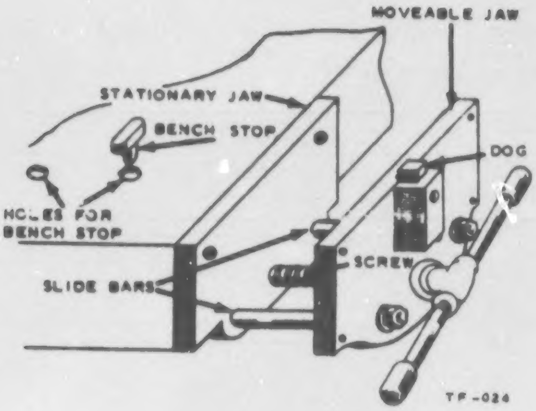
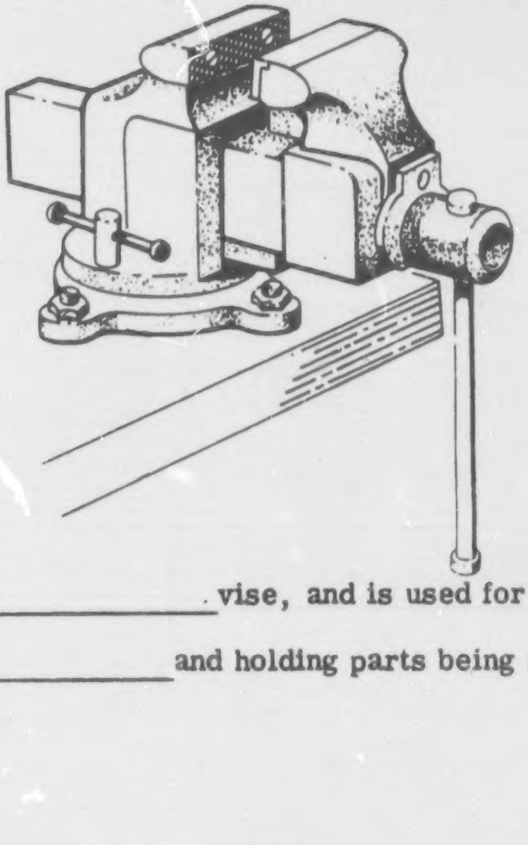
d.


MOVEABLE JAW
STATIONARY JAW
BENCH STOP
HOLES FOR BENCH STOP
DOG
SCREW
SLIDE BARS
TF-024

This is a ________________ vise, and is mounted on a woodworker's bench.

e.

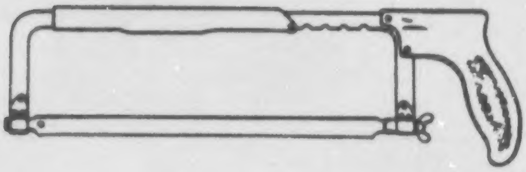


This is a ________________ vise, and is used for working

______________________ and holding parts being repaired.

3. Identify the cutting tools shown by writing their name or use in the space provided.

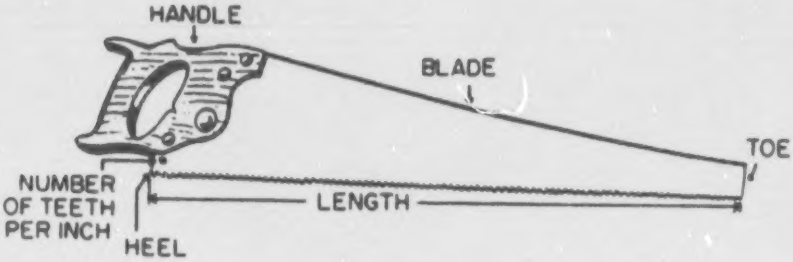
a.



A________________such as the one shown, is used for cutting

________________. Blades may be changed for different materials.

b.


HANDLE
BLADE
TOE
NUMBER OF TEETH PER INCH
LENGTH
HEEL

Handsaws are used for cutting__________________. A____________

is used for cutting at right angles to the grain. A_______________ saw is used for cutting parallel to the grain.

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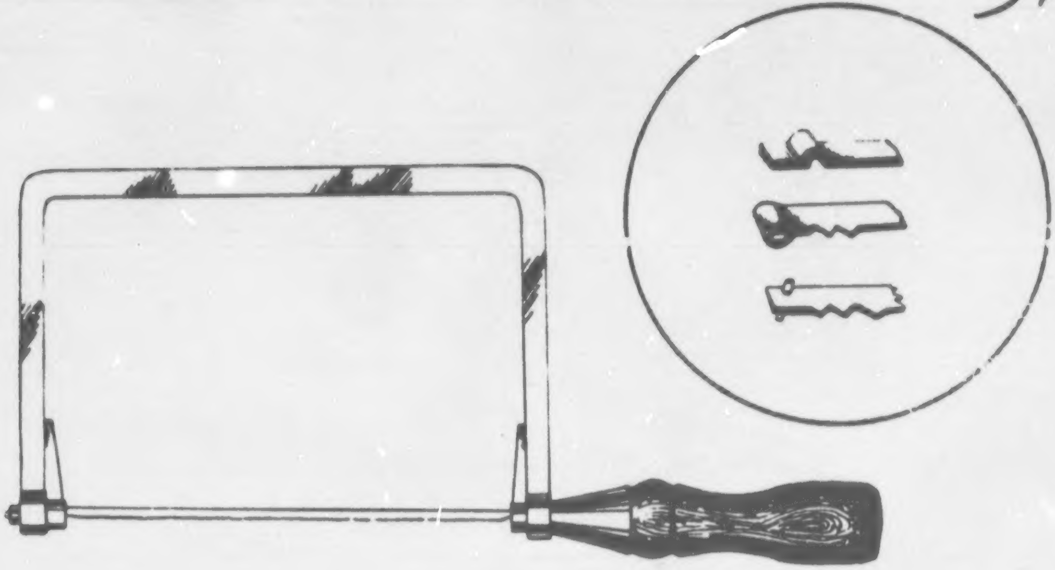
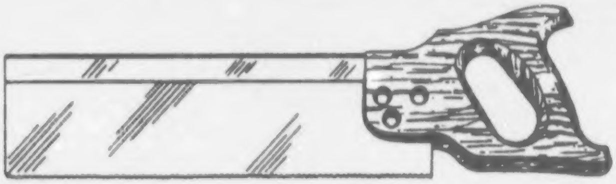
c.



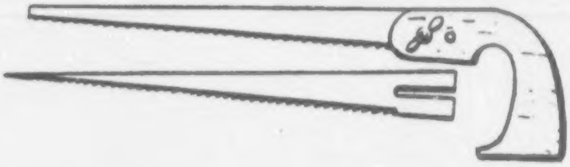
A ____________ saw is used for making intricate cuts in wood and making coped joints in interior trim.

d.



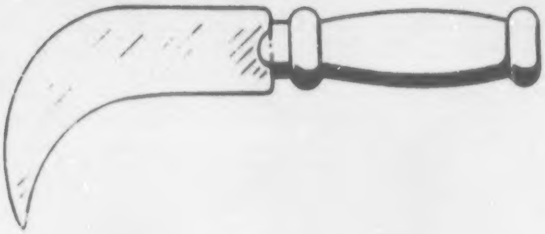
____________ saws are used for joint making, and where accuracy is required.

e.



____________ saws are used for cutting curves and for making cuts that cannot be started from an edge.

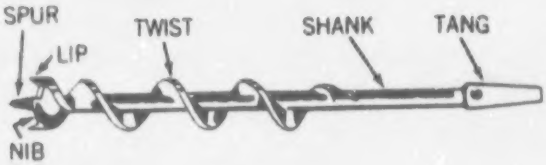
f.



The knife shown is called a ____________ knife, and may be used for cutting floor tile, linoleum, and building paper.

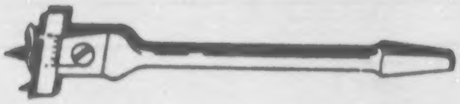
4. The following tools are boring tools. Identify them as to their name or use.

a.


SPUR
LIP
TWIST
SHANK
TANG
NIB

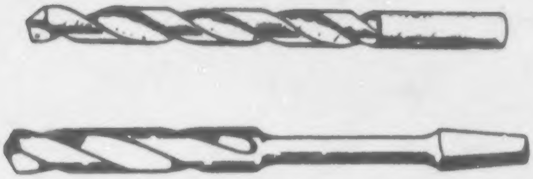
The bit shown is an ______________ bit, and is used for boring

holes in ____________________.



This is an ________________ bit, and can be ____________________ for boring various sized holes.

c.



These are ____________ drills, and may be used for drilling in _________

or ______________. High-speed steel drills are recommended for use with drill presses and portable electric drills.

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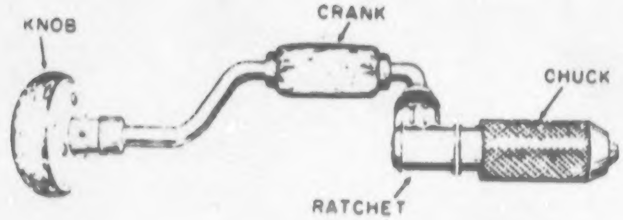
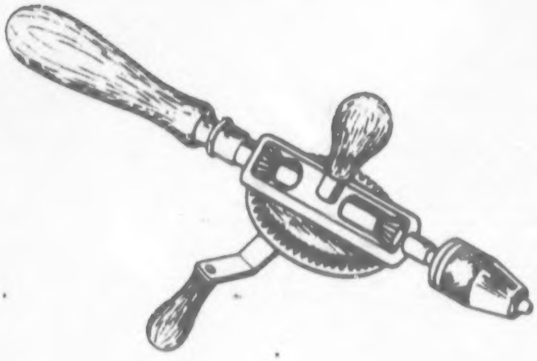
d.


KNOB
CRANK
CHUCK
RATCHET

This ________________________ is used for turning drills and bits.

e.



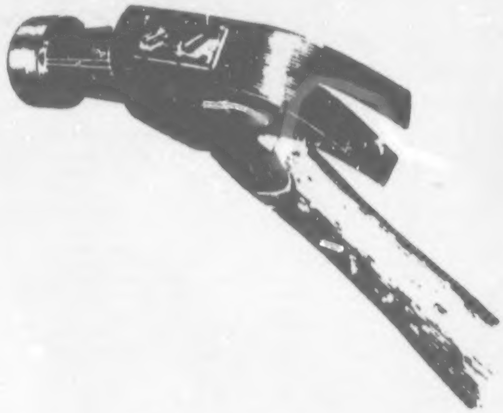
This ________________ drill is used to bore small holes for nails and screws. Bits may be stored in the handle of some models.

f.

This ____________________________ is used to bore holes known as "pilot holes" for screws.

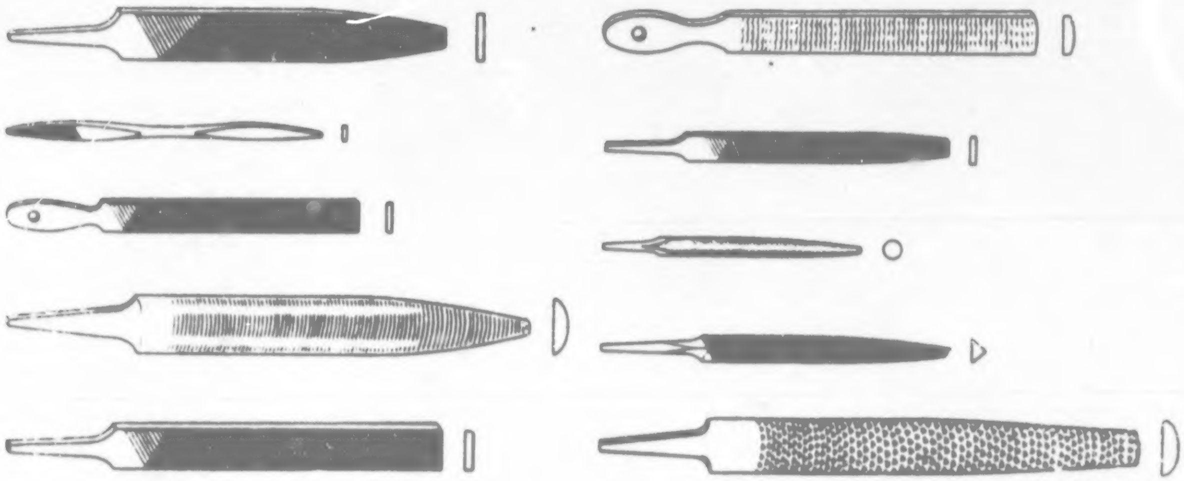
5. The following tools are used in carpentry and woodworking. Some are used in other trades and crafts. Identify them as to their name, use, or other designation.

a.



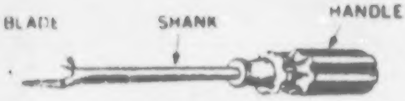
Claw hammers are used to drive and pull nails. Claw hammer sizes are designated by the ____________________ of the head.

b.

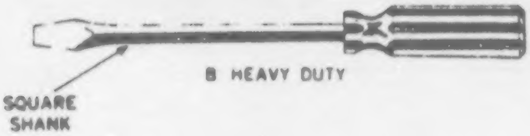


The tools shown above are ____________ and are used for smoothing, forming, or removing ________________ and ____________________.

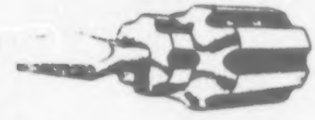
c.


BLADE
SHANK
HANDLE

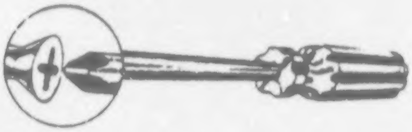
A STANDARD


SQUARE SHANK

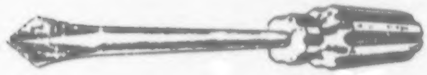
B HEAVY DUTY



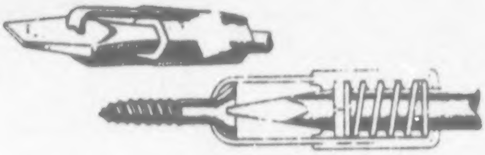
C STUBBY CLOSE QUARTER



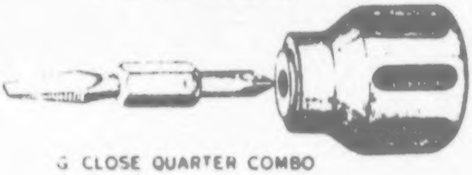
D PHILLIPS (CROSS TIP)



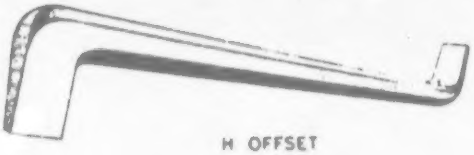
E REED AND PRINCE



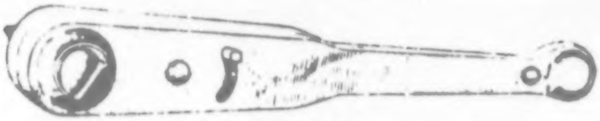
F SELF-HOLDING



G CLOSE QUARTER COMBO



H OFFSET

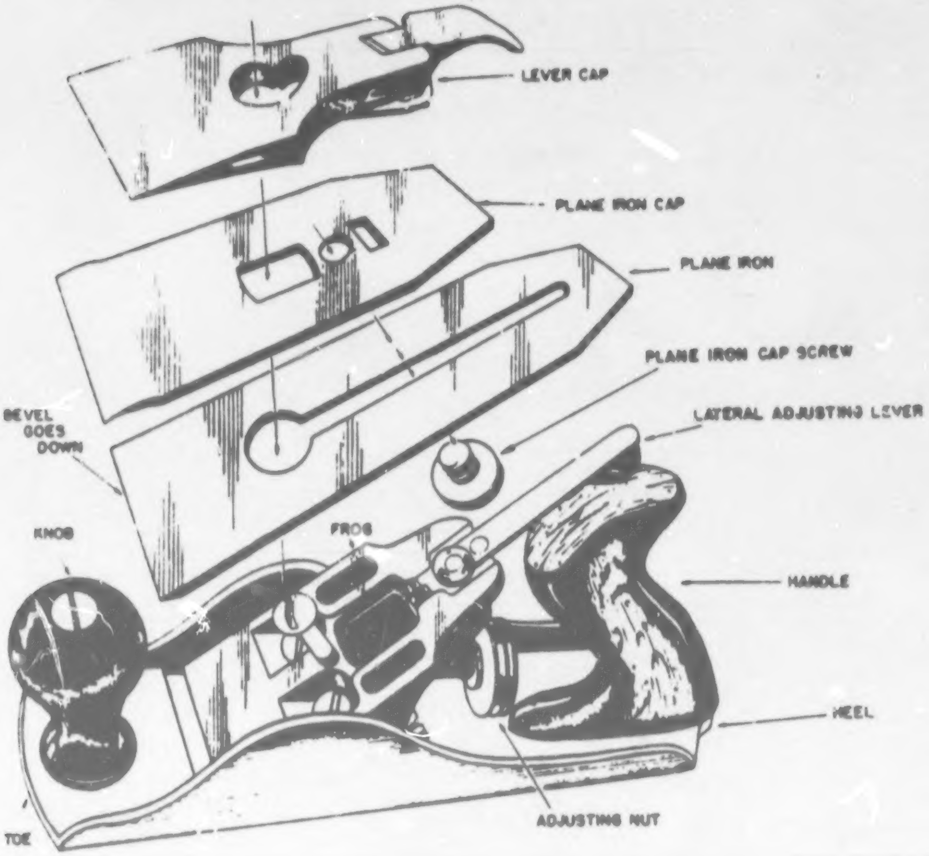


I RATCHET RIGHT ANGLE

The tools shown are ________________ and are used for ______________

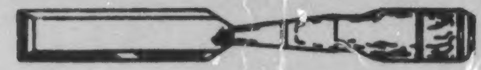
or torquing. ________________________.

d.


LEVER CAP
PLANE IRON CAP
PLANE IRON
PLANE IRON CAP SCREW
LATERAL ADJUSTING LEVER
BEVEL GOES DOWN
KNOB
FROG
HANDLE
HEEL
ADJUSTING NUT
TOE

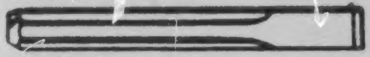
The tool shown is a ____________, and is used for __________________ or ________________________ a board or stock.

e.



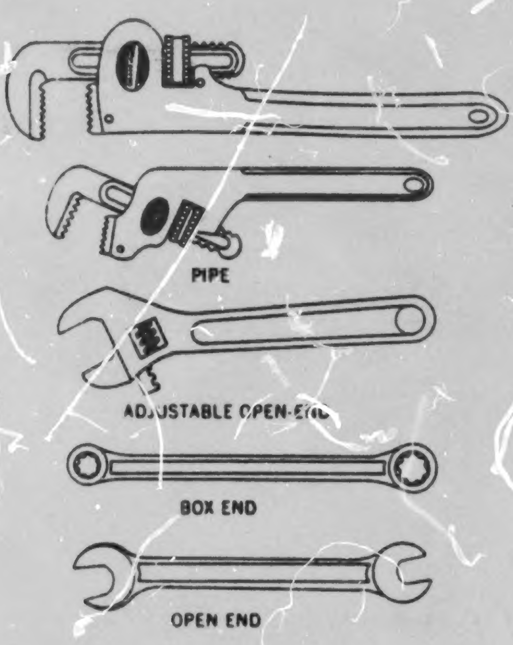
This tool is a ____________________ and is used to remove small amounts of wood.

f.



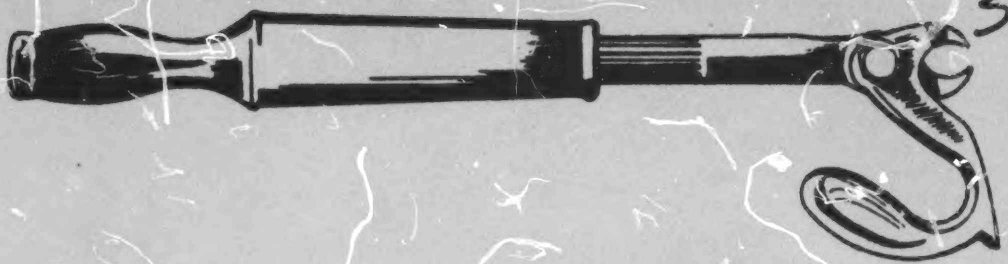
A ____________________ is used to cut bolts.

g.


PIPE
ADJUSTABLE OPEN-END
BOX END
OPEN END

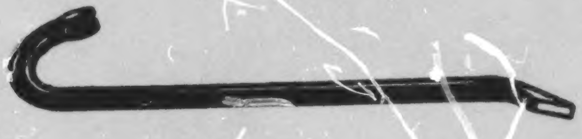
The tools shown are ____________________ and are used for turning or torquing bolts and pipes.

k.



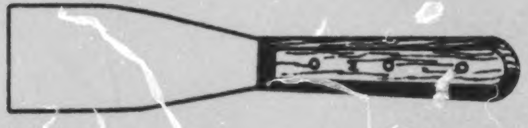
A ____________________ is used for removing nails, especially those that are driven flush or below the surface of wood.

i.



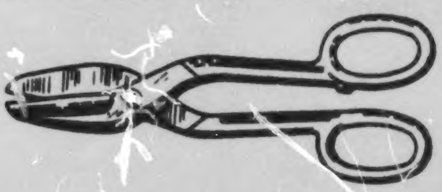
A ____________________ is used to pull large nails.

j.



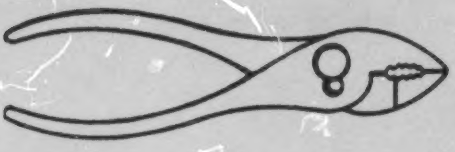
This tool is used to apply putty to holes in wood and to apply a smooth glazing compound when installing glass in a sash. It is called ____________________.

k.



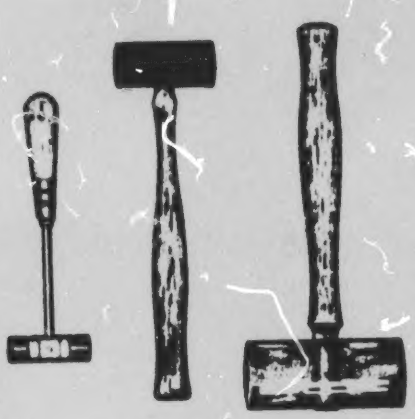
____________________ are used to cut light metal.

l.



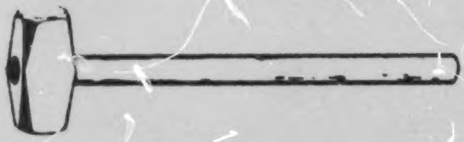
This tool is used where inconvenient or impossible to use your hands; they are called ______________________________.

m.



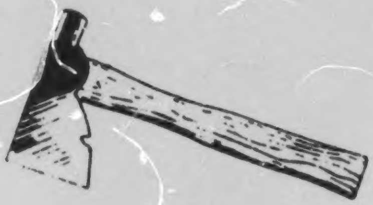
______________________________ are used to prevent damage to surfaces.

n.



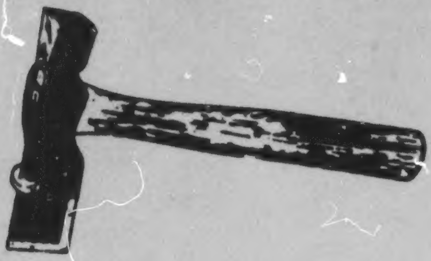
Do not drive wooden stakes with ______________________________.

o.



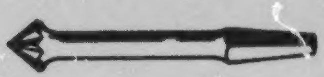
A ____________________ is used to sharpen wooden stakes.

p.



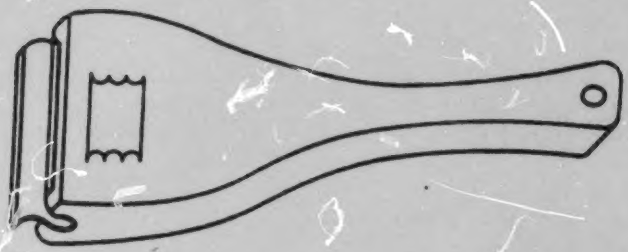
Wooden Shingles are nailed down with a ______________________.

q.



A ______________________________ is used to set head of screw below wood surface.

r.



______________________________ is used to remove paint from wooden surfaces.

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Mission 2

Following the procedures described in textbook, Modern Carpentry, Unit 1, Handtools, perform the maintenance on the handtools issued to you by your instructor.

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BUILDING MATERIALS

OBJECTIVE

When you have completed this unit of instruction you will be able to identify and select the proper building materials used by the carpenter.

INTRODUCTION

The wood you will be using in the Air Force is ready to use--it is sawed, dried, and dressed before you get it. If you know a few facts about lumber, you will be able to use it more intelligently and economically.

Wood construction requires some type of hardware. In the process of any construction the materials must be secured in a more or less permanent fashion. Although the carpenter works chiefly with wood, he must not only fasten wood to wood, but, sometimes, he must fasten wood to metal, concrete, brick or other material.

This study guide is divided into the following main topics:

- CLASSIFICATION OF WOODS
- COMMON WOODS
- PLYWOODS
- LUMBER SIZES
- LUMBER GRADES
- ROUGH HARDWARE
- FINISH HARDWARE

CLASSIFICATION OF WOODS

Wood is commonly classified as being SOFTWOOD or HARDWOOD. These two terms are often used by carpenters; however, they mean very little in reference to the hardness of wood. Some softwoods are harder than some hardwoods.

Hardwood and softwood are actually terms given to trees. If a tree has broad leaves and sheds them in the winter, the tree is called a hardwood tree. If the tree has needle leaves or cones (an evergreen), the tree is a softwood.

Hardwoods

Hardwoods all have several things in common. They are strong, close grained, tough, springy and durable.

Some common hardwoods are: ash, birch, beech, white oak, red oak, walnut, maple, and mahogany.

Softwoods

Softwoods normally grow rapidly and can be purchased cheaper than the hardwoods. The softwoods are most often used in house and building frameworks.

Some common softwoods are cedar, Douglas fir, white pine, yellow pine and redwood.

COMMON WOODS

TYPES	USES	CHARACTERISTICS
Ash	Cabinet work, handles for tools, baseball bats	Strong, heavy, hard, tough elastic, shrinks very little, takes excellent finish, lasts well.
Beech	Cabinet work, imitation mahogany furniture, wood dowels, interior finish, tool handles	Not durable to weather, shrinks and checks, light or dark red color.
Birch	Cabinet work, imitation mahogany furniture, wood dowels, interior finish, tool handles	Hard, durable, fine grain, even textured, heavy, tough, strong, takes high polish.
Cedar Red Western	Structural timbers, utility poles, major use is shingles and siding	Soft wood, light in weight, cedar-like odor, straight grain
Cypress	Siding, shingles, sashes, doors, interior wall paneling	Close grain, light weight, easily worked, rot resistant

TYPES	USES	CHARACTERISTICS
Douglas Fir	Framing, plywood general construction seldom used for finish	Strong, straight grained, splinters easily, sands poorly.
Maple	Excellent furniture, bars, counter tops, high grade flooring, dowels	Fine grain, heavy, tough, hard, strong, easy to work, excellent finish
Oak, White or Red	Major use is flooring, furniture, interior finishing, carvings	Heavy, very hard, durable, strong, takes high polish.
Philippine Mahogany	Medium price furniture, trim, major use is paneling	Not a true mahogany, medium hardness, splits, warps, easily worked.
Pine, White	Sashes, doors, cheap cabinets, interior and exterior frame work	Soft, light weight, easy to work, nails without splitting.
Pine, Yellow	Most important lumber for heavy construction, major use is in framing	Hard, strong, heavy, tough, durable in the ground.
Redwood	Exterior trim, shingles, fences siding	Extremely soft, light weight, not strong, very durable to weather, decay resistant.
Teak	Furniture, paneling used in construction and framing in Thailand, Burma and Vietnam	Stong, hard, oily feel, dulls saws rapidly, resembles walnut, resistant to weathering and decay.
Walnut	Expensive furniture cabinets, gun stocks, tool handles, trim	Dense, hard, very strong, non-splintery, carves easily, takes high polish.

PLYWOODS

Plywood as shown in figure 15 is made up of thin layers of wood that are glued face-to-face at right angles to one another. It always has an odd number of plies. Veneered stock for use in the manufacture of furniture, usually has five layers. A thick layer, called the core, is in the center. The layers glued on with their grain running across that are called cross bands. The surface layers or faces are placed so that their grain runs parallel to the long direction of the panel.

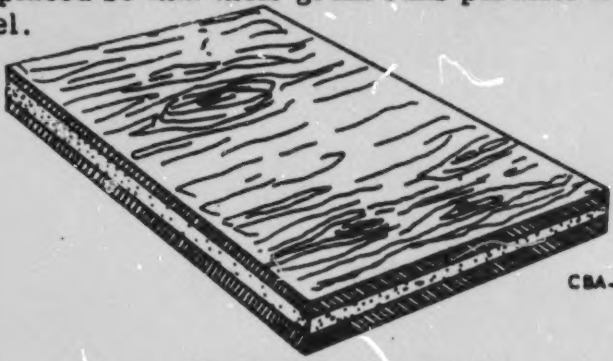


Figure 15. Plywood

Ordinarily 1/4-in and 1/8-in plywood (fir) has only 3 plies. Thicker plywood may have as many as 15 plies--but always an odd number. The standard size of plywood sheet is 4-feet wide by 8-feet long, though smaller and larger sizes are available. Because of the cross-grain effect, it is almost impossible to split plywood, and shrinking and swelling are negligible.

The development of special glues and other bonding materials has made possible a type of plywood highly resistant to water. It was widely used during World War II, and is still used extensively in the Air Force.

Grades of Plywood

There are two types of plywood--interior and exterior. Most plywood produced is of the interior type. Although it can stand an occasional wetting and subsequent normal drying without losing its original form and strength, interior plywood is unreliable in wet places. Exterior type plywood will retain its original form and strength when repeatedly wet and dried and otherwise subjected to the elements. It is suitable for permanent exterior use. Most plywood is branded or stamped on the edge with the symbol "EXT." or "INTERIOR" (INT). In addition, other markings carrying more complete information are stamped on the back of the plywood sheet. A typical Douglas fir back stamp, with all symbols explained, is shown in figure 16.

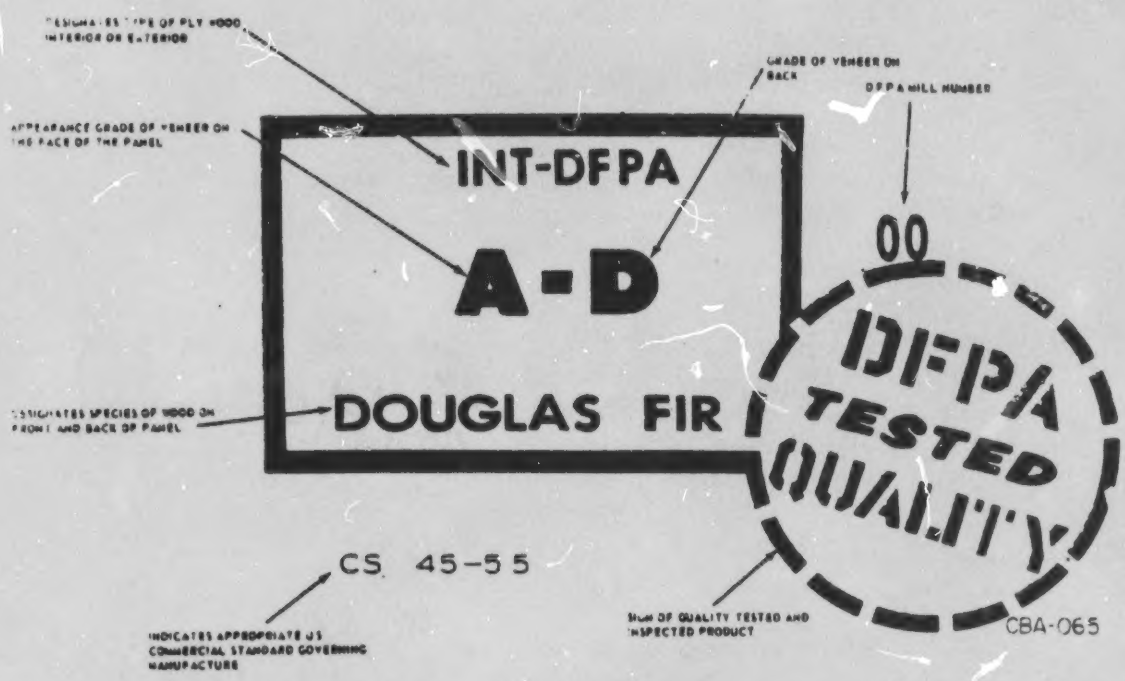

DESIGNATES TYPE OF PLYWOOD INTERIOR OR EXTERIOR
GRADE OF VENEER ON BACK
DFPA MILL NUMBER
APPEARANCE GRADE OF VENEER ON THE FACE OF THE PANEL
INT-DFPA
A-D
00
DFPA TESTED QUALITY
DESIGNATES SPECIES OF WOOD ON FRONT AND BACK OF PANEL
DOUGLAS FIR
CS 45-55
INDICATES APPROPRIATE US COMMERCIAL STANDARD GOVERNING MANUFACTURE
SIGN OF QUALITY TESTED AND INSPECTED PRODUCT
CBA-065

Figure 16. Typical Douglas Fir Back Stamp

Plywood is graded by the quality of the face veneers with A being the best and D the poorest. The grading is based upon the number of defects such as knotholes, pitch pockets, and splits, and the presence of streaks, discolorations, sapwood, shims and patches in each face of the panel. Plywood also comes with resin-impregnated fiber faces which provide better painting surfaces and better wearing qualities.

Plywood Storage

Because of the conditions of its manufacture, plywood can generally be assumed to be dry when received. It should therefore be stored in a closed shed. For long storage in winter or the rainy season, a heated storage building is recommended.

Plywood is commonly piled solid. Under humid conditions, there is some tendency for edges to swell because of exposed end grain, and this swelling causes dishing, especially in the upper panels of high piles. Dishing can be minimized by placing strips in the pile at intervals. Enough strips should be used so that plywood will not bend between them. Dry 1-inch strips are suitable for supporting plywood.

Plywood Forms

Plywood reusable concrete forms should be stacked flat on dry, level platforms after use. Wet faces should be separated with strips to permit drying. If unused for long periods, forms should be stored indoors after being cleaned and dried. Before reuse, the faces should be oiled with standard wood form oil or pale oil. Newly cut edges should be sealed with white lead and oil or some other sealer.

LUMBER SIZES

The NOMINAL cross section dimensions of a piece of lumber (2 x 4, 1 x 2, 8 x 10, etc.) are always larger than the actual DRESSED dimensions. Dressed lumber is lumber which has been SURFACED (planed smooth) on two or on all four sides. Lumber which has been surfaced on two sides is designated as S2S (surfaced two sides); lumber which has been surfaced on all four sides is designated as S4S (surfaced 4 sides). Most lumber used in general construction is S4S. The nominal sizes and the actual dressed (S4 dimensions of some common sizes of boards are as follows:

Nominal size	Dressed dimensions
1 x 6	3/4 x 5-1/2
1 x 8	3/4 x 7-1/2
1 x 10	3/4 x 9-1/2

The nominal sizes and the actual dressed (S4S) dimensions of some common sizes of dimension lumber are as follows:

Nominal size	Dressed dimensions
2 x 2	1 1/2 x 1 1/2
2 x 4	1 1/2 x 3 1/2
2 x 6	1 1/2 x 5 1/2
2 x 8	1 1/2 x 7 1/2
2 x 10	1 1/2 x 9 1/2
2 x 12	1 1/2 x 11 1/2
4 x 4	3 1/2 x 3 1/2

All softwood framing lumber and most other softwood lumber are cut to even-numbered-feet lengths, such as 10 ft, 12 ft, 14 ft, and so on. Hardwood is sometimes cut to odd-numbered, as well as even-numbered-feet lengths.

LUMBER GRADES

Lumber is graded for quality in accordance with American Lumber Standards set by the National Bureau of Standards for the US. Department of Commerce. The major quality grades, in descending order of quality, are SELECT LUMBER and COMMON LUMBER.

Select lumber is primarily used in furniture, kitchen cabinets, and commercial items that require blemish-free appearances.

Common lumber is normally used as structural lumber. It is graded as follows:

NO. 1 COMMON lumber is sound, tight-knotted stock, containing only a few minor defects. It must be suitable for use as watertight lumber.

NO. 2 COMMON lumber contains a limited number of significant defects, but no knotholes or other serious defects. It must be suitable for use as graintight lumber.

NO. 3 COMMON lumber contains a few defects which are larger and coarser than those in No. 2 Common; occasional knotholes, for example.

NO. 4 COMMON lumber is low-quality material, containing serious defects like knotholes, checks, shakes, and decay.

NO. 5 COMMON is capable only of holding together under ordinary handling. (The grades of construction, standard, utility, and economy are used in some associations.)

All species are covered by the grading rules and size standards of some association or grading bureau. In the case of softwood lumber standards are set by a regional manufacturer's association; in the case of hardwood lumber, there is but one national association. In a few cases, softwood species growing in more than one region are graded under rules of two different associations. There is great advantage to the purchaser, whether large or small, to buy according to his own individual specifications unless the requirements are actually very unusual. Occasionally, a departure from the standard grade provision is necessary to cover unusual requirements. This is best handled as an exception to a standard grade, rather than as an entirely special grade.

ROUGH HARDWARE

In building construction, the rough hardware is usually the metal items used where extra strength is required. This group consists of a large number of items generally made of iron or steel with no particular ornamental finish on the metal. Rough hardware may be concealed within the walls of a structure or exposed to provide security on temporary constructions. Rough hardware is not used for decorative purposes and generally does not add to the appearance of the building.

Nails

Two general kinds of nails are used by the woodworker. They are cut nails and wire nails, as illustrated in figure 17. Cut nails are made by machine from steel plate. They are wedge-shaped, with a head on the large end, and are often used to nail flooring because they are very hard steel and have good holding power.

Wire nails are formed by machine from standard sized wire. The wire is fed into the machine from a roll; it is straightened, the point is cut, and the head is formed all in one operation.

Figure 17. Kinds of Nails

Nail sizes are given by a penny number from twopenny to sixpenny. This number was originally the weight of 1,000 nails. A small letter "d" is usually used to abbreviate penny. The penny number now refers to the length of the nail instead of its weight. The nail chart in figure 18 shows the length of nails from 2d to 20d. Nails are usually packaged in 100-pound wooden kegs. Smaller quantities, however, may be purchased.

Wire nails are divided into six main types: common, box, finishing, casing, duplex head, and special. Figure 19 illustrates five of these main types.

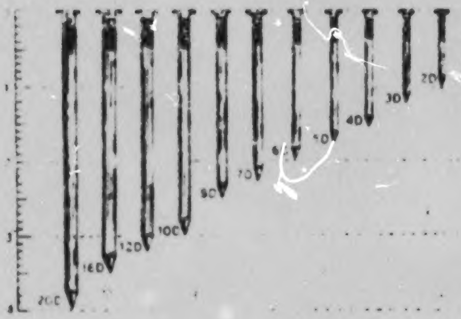


Figure 18. Sizes of Nails

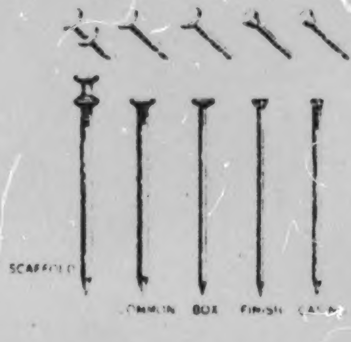


Figure 19. Types of Wire Nails

COMMON NAILS. Common wire nails have a fairly thick flat head. They are generally used for most phases of building construction. The wire from which they are made is large enough for easy driving without bending.

BOX NAILS. Box nails are used in box construction or wherever there is a possibility of splitting the wood with a common nail. These nails are easier to bend while driving because of the smaller diameter wire used to form them. The head of a box nail is somewhat thinner and larger in diameter than the head of a common nail. Box nails are sometimes coated with a special cement to give them better holding qualities and make them harder to pull. These are called cement-coated box nails or "sticky" nails.

FINISHING NAILS. Finishing nails and box nails are made of the same diameter wire. The head of a finishing nail is only slightly larger in diameter than the body of the nail so that it can be embedded (set) into the surface of the wood. There is a slight depression on the top of the head to help prevent the nail set from slipping off the head. The small hole that is made in the wood is filled with glazier's putty or some other filling agent to hide the nail when the surface is finished.

CASING NAILS. The casing nail is similar to the finishing nail in appearance. The head, however, is slightly larger and has no depression in the top. These nails are used to nail door and window casings in place.

DUPLEX HEAD NAILS. The duplex head nail is the same diameter as the common nail, the difference being the double head provided on the nail. These nails are used on scaffolds, forms, or wherever the construction is temporary and it is necessary to remove the nails after a short time. The first (bottom) head draws the board and has a good binding effect, while the second (top) head sticks out so that it can be used for pulling the nail.

SPECIAL NAILS. There are many specialized nails available today. Each is designed for a special purpose, some with annular or spiral threads that greatly increase their holding power such as:

Masonry nails
Trussed rafter nails
Flooring nails
Underlay floor nails
Drywall nails
Roofing nails with Neoprene washers
Asphalt shingle nails
Wood shingle nails
Nails for applying siding to plywood.
Nails for applying roofing to plywood.

Other types of special fasteners include such items as:

Wire nails and brads which range in size from 3/16 inch to 7/8 inch and used for small finish work.

Fence staples of various sizes for securing wire in place.

Corrugated nails for fastening mitre or square joints, edge to edge as found on wooden screen frames.

Spikes that range from 4 inches to 12 inches for heavy work.

Roofing nails with straight shanks of various sizes and head types.

Glazier points, diamond or triangular shaped for holding glass in place.

Screw nails that can be driven in with a hammer and removed with a screwdriver inserted in the slotted head.

Tacks of various shapes and sizes.

This shows that there is a nail for every job. You will be concerned in the most part with the first five types of nails mentioned.

Nails must sometimes be used where the head is exposed to the weather. The head often rusts and causes a black streak along the grain of the wood, even though it is painted. It is desirable then to use a nail that will not rust. Plain wire nails that have a zinc coating are often used where there is a possibility of rusting. These are called galvanized nails. The zinc is sometimes cracked or chipped off the body of the nail and allows the nail to rust. They are probably the most commonly used rustproof nail, because they are only slightly more expensive than ordinary nails. There are other nails made of solid copper or aluminum which are rustproof. They are, however, more expensive than galvanized or copper coated nails.

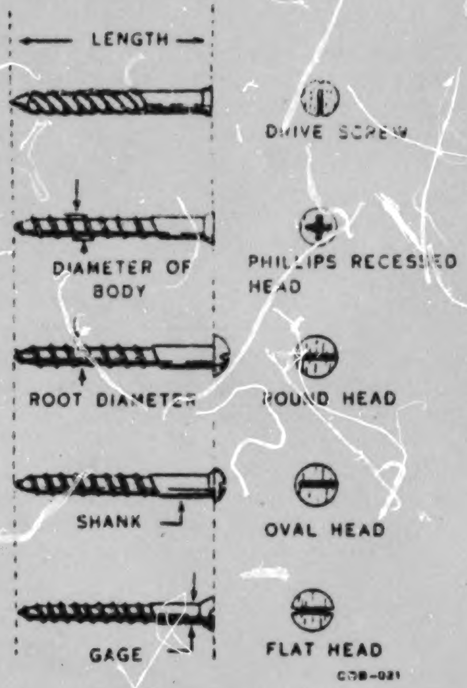


Figure 20. Types of Screws

Wood Screws

Wood screws are made of iron, bronze, brass, copper, or other metals. They are sometimes plated with nickel or chrome to match special finish hardware. Wood screws have some advantages over nails, but they also have disadvantages. A few of the advantages are that they will hold the wood more securely than nails, they are easily tightened and removed, and the heads are neat in appearance and are often left exposed on finished surfaces. Some of the disadvantages are that they are more expensive than nails and require more care and labor to drive them. Wood screws are made with heads of various shapes, either flat, oval, or round, as shown in figure 20. They may have different-sized shanks and a great variety of lengths. The shank of the screw is the smooth part of the screw between the head and the threads or spiral.

The size of a screw is designated by a gage number that represents the diameter of the shank of the screw. If the diameter is known, the approximate gage can be determined by subtracting 1/16 inch from the diameter and multiplying by 80. For example, the diameter of a screw is approximately 3/16". Subtract 1/16" from 3/16" and the result is 1/8". One-eighth multiplied by 80 equals 10, so the screw gage is 10. If the screw gage is known, the diameter can be determined by dividing it by 80 and adding 1/16. The variation in length of wood screws is about the same as that for nails, except that each gage of screw is made in several lengths. The length and gage number must both be given when specifying screws. For example, 1 1/4" by 10. Screws are packaged in cardboard boxes of 1 gross each; however, they can usually be purchased by the dozen.

DRIVE SCREWS OR SCREW NAILS. Special screws that are made to be driven with a hammer are called drive screws or screw nails. They may have a round head but are usually made with a flat head. They are made with the threads far apart and may have no slot for a screwdriver. Drive screws are available in the same sizes as wood screws, and in addition, they are available in larger sizes with a square head similar to lag screws.

PHILLIPS-HEAD SCREWS. These are called Phillips screws, and a special screwdriver is required for driving them. Some advantages of the Phillips screw are that the screwdriver does not slip out easily and the head is not as apt to break as that of a conventional type screw.

ROUNDHEAD SCREWS. The roundhead screw is usually used on a surface where the head will show. The head is not countersunk, and for this reason, it should have a pleasing finish - either blued or polished. The screw slot should always be left in a position parallel to the grain of the wood.

OVAL-HEAD SCREWS. The oval-head screw is used to fasten hinges or other finish hardware to wood. The screw slots of all these screws should be parallel to each other for better appearance.

FLATHEAD SCREWS. Flathead screws are made to be used where the head will not show. The head should be countersunk until it is level with or slightly below the finished surface. If flathead screws are used on an exposed area, they should be countersunk in a hole that can be plugged.

SPECIAL SCREWS. Many special hanging and fastening devices having a screw-type body are shown in figure 21. The screw eye is often used on picture frames, screen doors, and many other items. The curved screw hook and right-angled screw hook are mainly used for hanging articles. The curved screw hook is usually used in the ceiling, while the right-angle hook is more often used on vertical walls.

Sheet Metal Screws

These screws are designed to fasten sheet metal together. They are designed to tap a thread as they are given. Some types are self-drilling as well.

Bolts

Bolts are made of steel with either a round, square, or octagon head and a threaded shank, as shown in figure 22. The threads may run the full length of the bolt; or they may stop a certain distance from the head, leaving a smooth upper shank. Bolts are used to fasten timber, steel or other materials. They range in diameter from 3/16" to 1 1/2", and in length from 3/4" to 30." They are available in three main styles: stove bolts, machine bolts, carriage bolts, and lag bolts. Stove bolts, however, are used mostly with small items of hardware.

CARRIAGE BOLTS. Carriage bolts are like machine bolts except for the head, which is round. The shank of the carriage bolt has a square portion that draws into the wood and prevents the bolt from turning as the nut is tightened. A washer is used under the nut of the carriage bolt but not under the head.

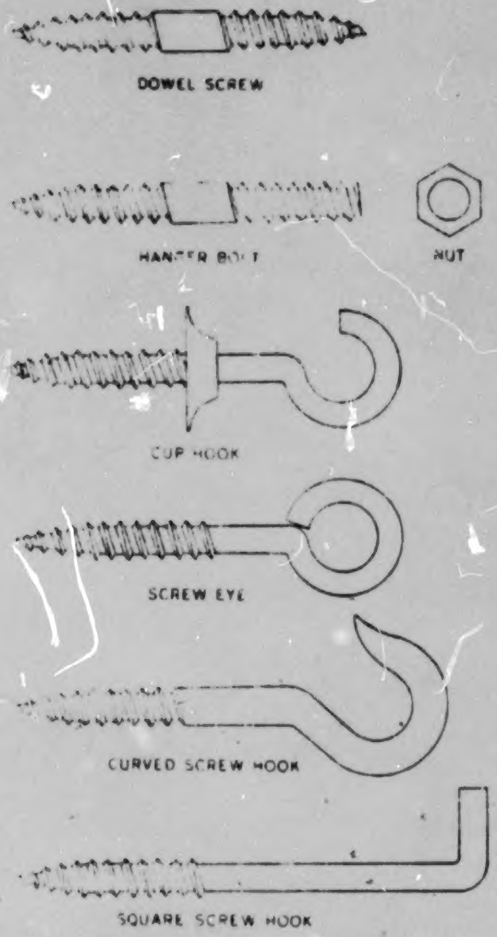

DOWEL SCREW
HANGER BOLT
NUT
CUP HOOK
SCREW EYE
CURVED SCREW HOOK
SQUARE SCREW HOOK

Figure 21. Special Screws

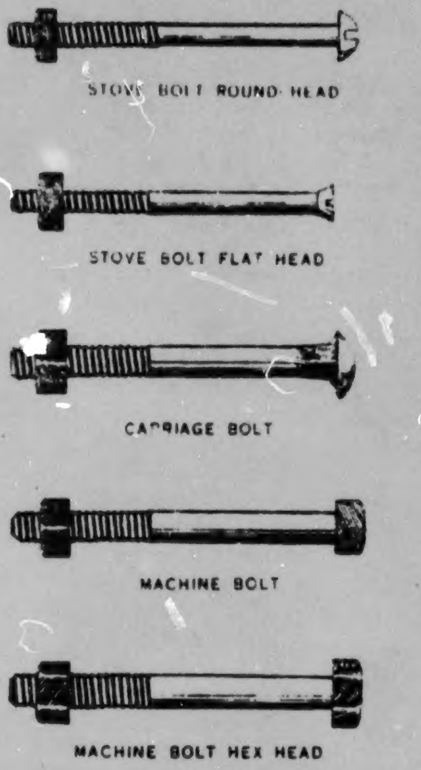

STOVE BOLT ROUND HEAD
STOVE BOLT FLAT HEAD
CARRIAGE BOLT
MACHINE BOLT
MACHINE BOLT HEX HEAD

Figure 22. Types of Bolts

MACHINE BOLTS. The machine bolts used in the woodwork usually have square heads and square nuts. A metal washer is generally used under both the head and the nut. These washers prevent the head from embedding into the wood and keep the nut from tearing the wood fibers as it is turned. Two wrenches are required when tightening the machine bolt.

LAG BOLT. A lag bolt is a heavy steel screw with a square or hexagon bolthead, used for fastening heavy timers.

Nuts

SQUARE AND HEXAGONAL. These nuts are standard but they are supplemented by special nuts (see figure 23). One of these is the JAM NUT, used above a standard hex nut to lock it in position. It is about half as thick as the standard hex nut, and has a washer face.

CASTELLATED. These nuts are slotted so that a COTTER KEY may be pushed through the slots matching a hole in the bolt. This provides a positive method of preventing the nut from working loose. For example, you will see these nuts used with the bolts that hold the two halves of an engine connecting rod together. They are usually used with machine bolts.

WINGNUTS. Wingnuts are used where frequent adjustment is required. CAP or ACORN NUTS are used where appearance is an important consideration. They are usually made of chromium-plated brass.

SELF-LOCKING NUTS. These nuts are used where it is imperative that the nut does not come loose. These nuts have a fiber or composition washer built into them which is compressed automatically against the screw threads to provide holding tension.

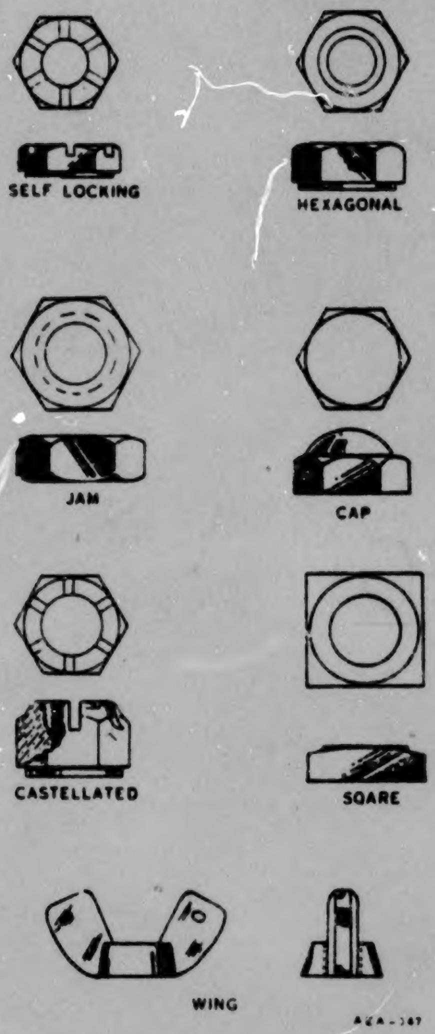


Figure 23. Common Kind of Nuts

Washers

Figure 24 shows the types of washers used most frequently.

FLAT WASHERS. These are used to back up boltheads and nuts, and to provide larger bearing surfaces. They also prevent damage to the surfaces of the metal parts through which a bolt passes.

SPLIT LOCKWASHERS. These washers are used under nuts to prevent loosening by vibration. The ends of these spring-hardened washers dig into both the nut and the work to prevent slippage.

SHAKEPROOF LOCKWASHERS These washers have teeth or lugs that grip both the work and the nut. Several patented designs, shapes, and sizes are obtainable.

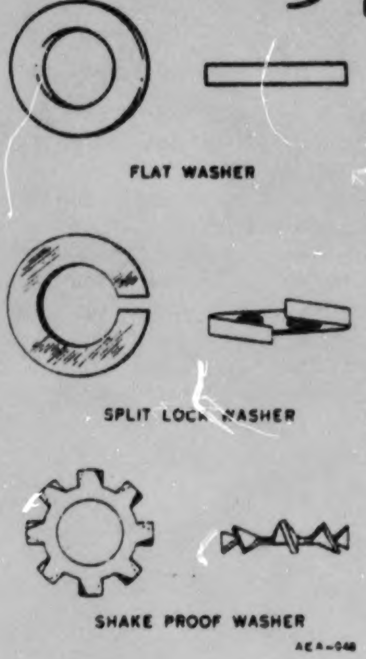


Figure 24. Washers

Keys

Cotter keys, as shown in figure 25, are used to secure castellated nuts on bolts and rods. They are also used as stops and holders on shafts and rods. Square keys and woodruff keys are used to prevent handwheels, gears, cams, and pulleys from turning on a shaft. These keys are strong enough to carry heavy loads if they are fitted and seated properly.

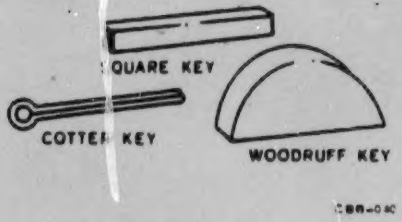


Figure 25. Types of Keys

Miscellaneous

EXPANSION SHIELDS. Lag bolts are used with expansion shields for anchoring frame construction, machines, or hardware items to concrete that has hardened. A hole is drilled into the concrete the size of the outside diameter of the expansion shield, and the shield is placed in the hole. The shield expands, as shown in figure 26, and holds against the side of the hole as the lag screw is driven into the shield.

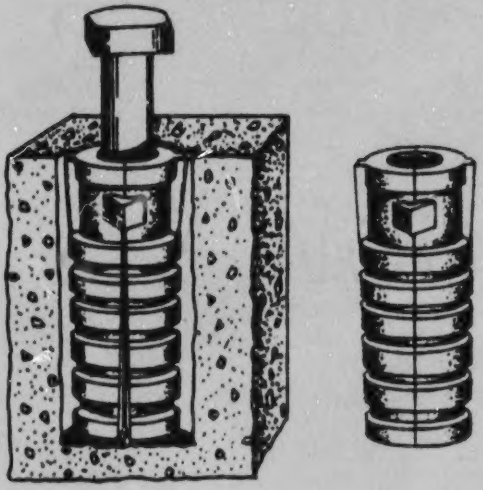


Figure 26. Expansion Shields

MOLLY UNIVERSAL SCREW ANCHORS. Molly fasteners are used to provide a solid means of attaching fixtures to interior walls. A hole is drilled the same size as that of the outside diameter of the fastener. They are designed to expand behind the wall covering, as shown in figure 27, and will stay in place when the bolt is removed.

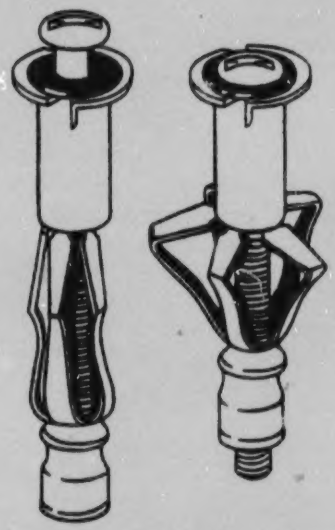


Figure 27. Molly Fasteners

TOGGLE BOLTS. Toggle bolts are used to fasten wood stringers or fixtures to masonry walls. There are two common types of toggle bolts: the pivot-wing type and the spring-wing type. Both types have heads similar to those of ordinary wood screws.

404

You will note in figure 28 that the pivot type has a bent iron channel with the nut slightly off center so that one end of the channel is heavier than the other. A hole is drilled into the plaster wall, going through to the hollow space. The heavy end of the nut drops down at right angles to the bolt when it is inserted into the hole. The nut will pull up tight against the lath and plaster as the bolt is tightened.

The spring type is made like the pivot type except that the wing is hinged in the center. It is held open with a small spring and can be closed while inserting it into the hole. It snaps open when it enters the hollow cavity of the wall. Tightening is done in the same manner as with the pivot type.

The bolt should not be removed after it has been inserted into the hole because the nut will fall. The spring type works very well on either vertical walls or ceilings. The pivot type, however, is not satisfactory overhead. Both types of toggle bolts are available in various sizes.

LEAD ANCHORS. This is a wood screw anchor for lighter weight fixtures in masonry. It is made of lead and will expand without turning.

FIBER ANCHORS. This is a wood screw anchor made of closely woven jute bonded over a core of lead. It can be used with any self-tapping screw to make fastenings to masonry, gypsum, marble, slate, terra cotta, and structural glass.

PLASTIC ANCHORS. Anchors are used with either wood screws or sheet metal screws. They are recommended for fastening of fixtures such as mirrors, pictures, cabinets, curtains, drapes, shelf brackets, etc.

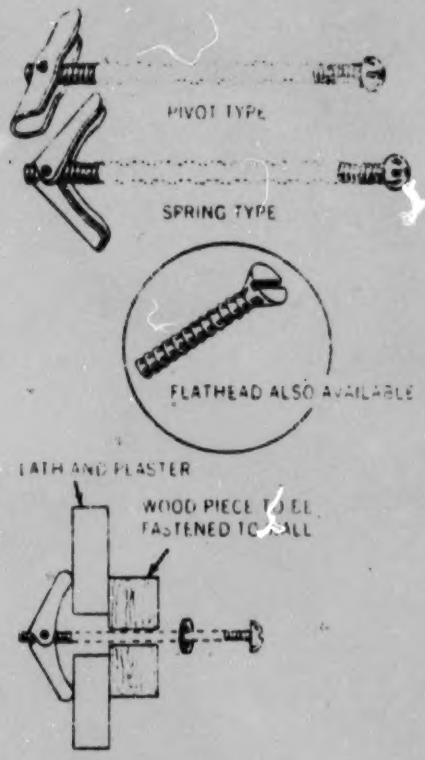


Figure 28. Toggle Bolts

FINISH HARDWARE

Hardware that has a functional and/or ornamental purpose, such as hinges, pulls, knobs, locks, closers, etc, are classed as finish hardware. This class of hardware is so large it would be difficult to discuss it completely, so this study guide will cover only the most commonly used items.

Hinges

Many different types, styles and sizes of hinges are used by the woodworker. They are, however, all used to make a movable joint between two pieces of material. They are made of different metals for various uses.

BUTT HINGES. Butt hinges are usually mortised into the jamb and the edge of the door or applied fully to the surface. Another type is the half surface butt which is mortised into the jamb and fastened to the door surface.

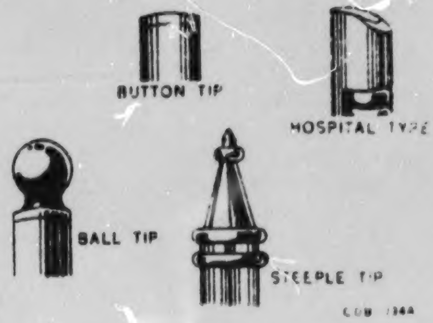
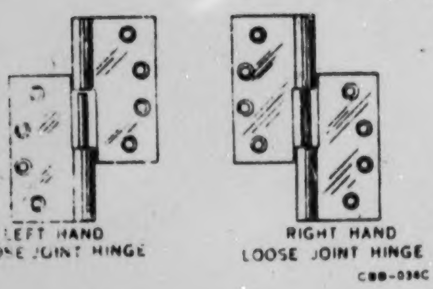


Figure 29. Hinge Tips

The round central portion of the butt hinge is called the barrel. The flat parts are called the leaves. The two leaves are held together by a pin running through the barrel.



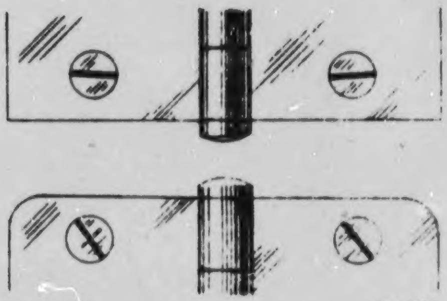


Figure 30. Loose Joint Hinges

Figure 31. Square and Round Corner Hinges

Loose pin types are common to allow removal of the door by removing the pins. Hinge pin tips are of various designs as shown in figure 29. Button tips are the most used.

Solid pin types are used in areas where pin removal is not desirable.

Loose joint hinges, as shown in figure 30, are used for easy door removal.

Either square or round corner butts, as shown in figure 31, are used for hanging doors. Square corner butts are used when the gains (mortises) in the jamb and/or door are cut with a chisel. Round corner butts are used when the gains are cut with a router (portable electric power tool).

Butt hinges also differ in that some are swaged and some are beveled.

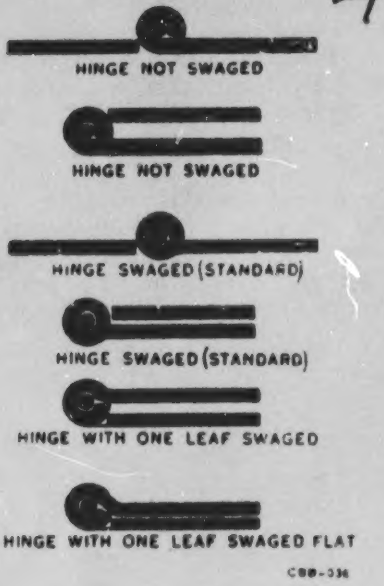

HINGE NOT SWAGED
HINGE NOT SWAGED
HINGE SWAGED (STANDARD)
HINGE SWAGED (STANDARD)
HINGE WITH ONE LEAF SWAGED
HINGE WITH ONE LEAF SWAGED FLAT
CBB-036

Figure 32. Hinge Swaging

Swaging, as shown in figure 32, is a slight offset of the hinge leaf at the barrel which permits the leaves to come closer together when closed.

Beveling the inner edges of the leaves, as shown in figure 33, makes close fitting joints and adds greatly to the appearance of the hinge.

The leaves of a full mortise hinge are completely hidden, leaving only the barrel exposed when the door is closed (figure 34). A gain (mortise) is required for each leaf. The gain for one leaf is in the edge of the door and the other gain is in the door frame. The gains make this type of hinge one of the most difficult to install.

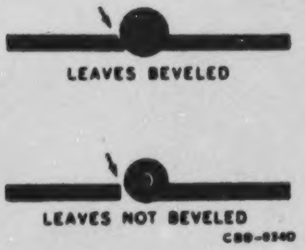

LEAVES BEVELED
LEAVES NOT BEVELED
CBB-036D

Figure 33. Beveling of Leaves

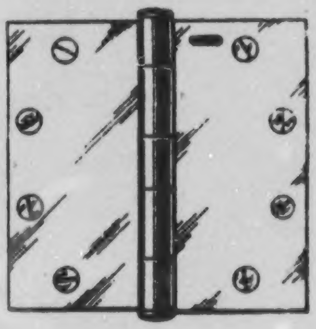


Figure 34. Full Mortise Hinge

You will note in figure 35 that the half surface butt-type hinge is similar to the full mortise hinge. One leaf is fastened on the surface of the door and the other leaf fits into a gain in the frame. The hinges used on passage doors are usually half surface or full mortise butts.

The full surface hinge, as shown in figure 36, requires no gain for either leaf. One leaf is screwed to the flat surface of the door and the other leaf is screwed to the frame. The surface of the frame and door must be flush when full surface hinges are used. All outside edges of this hinge are beveled to give it a finished appearance when mounted to the door and jamb.

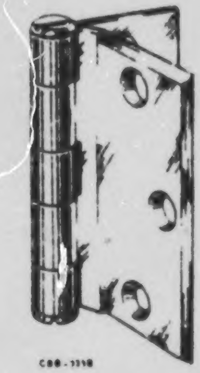


Figure 35. Half Surface Hinge

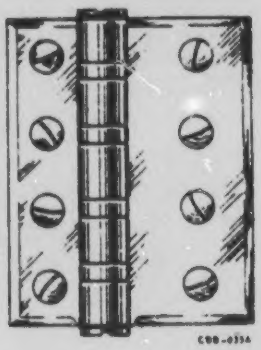


Figure 36. Full Surface Hinge

UTILITY HINGES. This class of hinge which includes the T-hinge and strap hinge, as shown in figure 37, is used primarily on rough work such as gates, boxes, storeroom doors, etc. These hinges are full surface hinges that can be mounted with screws or bolts.

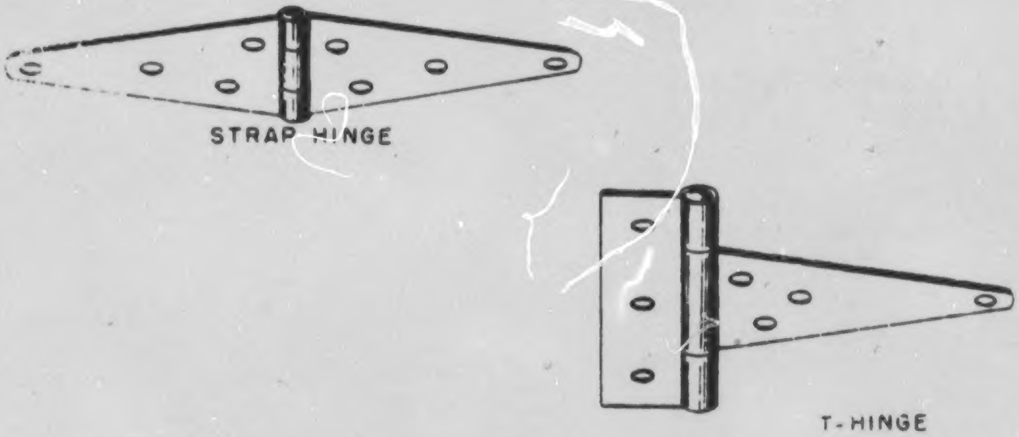


Figure 37. Utility Hinge.

SPECIAL HINGES. This class of hinge provides hinges for all types of installation. Figure 38 shows some of the more commonly used special hinges.

The continuous hinge is used to reinforce the door and jamb along its entire length.

The screen door hinge without the spring is used when the door is equipped with a closing device. The hinge with a spring acts as a hinge and closing device combination.

Screw hook and strap hinges as well as the bolt hook and strap hinges are used on heavy gates.

HINGE HASPS. A hinge hasp (figure 39) is made similar to a hinge, but the leaves are made differently. One leaf has screw holes for fastening the hasp in place, the other leaf is longer with a slot cut near the outer end. A heavy metal loop is used with the hinge hasps. The base of the loop is fastened in place with four screws. The slot in the long leaf of the hasp fits over the loop. The hasp is used with a padlock as a locking device.

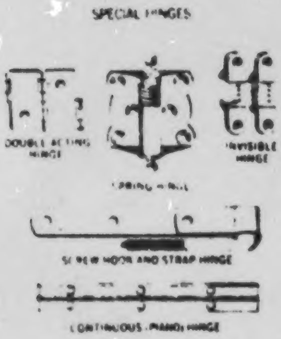

SPECIAL HINGES
DOUBLE ACTING HINGE
SPRING HINGE
INVISIBLE HINGE
SCREW HOOK AND STRAP HINGE
CONTINUOUS (PIANO) HINGE

Figure 38. Special Hinges

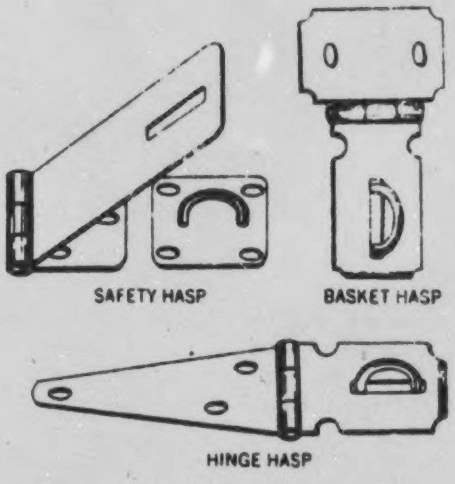

SAFETY HASP
BASKET HASP
HINGE HASP

Figure 39. Hinge Hasps

CABINET HINGES. Cabinet hinges are made in many styles and finishes to provide an adequate selection for every type of cabinet. Figure 40 shows several types. These hinges are available in several finishes including primed for painting, polished brass, dull brass, old copper, polished copper, dull bronze, dull black, polished chrome, and dull chrome.

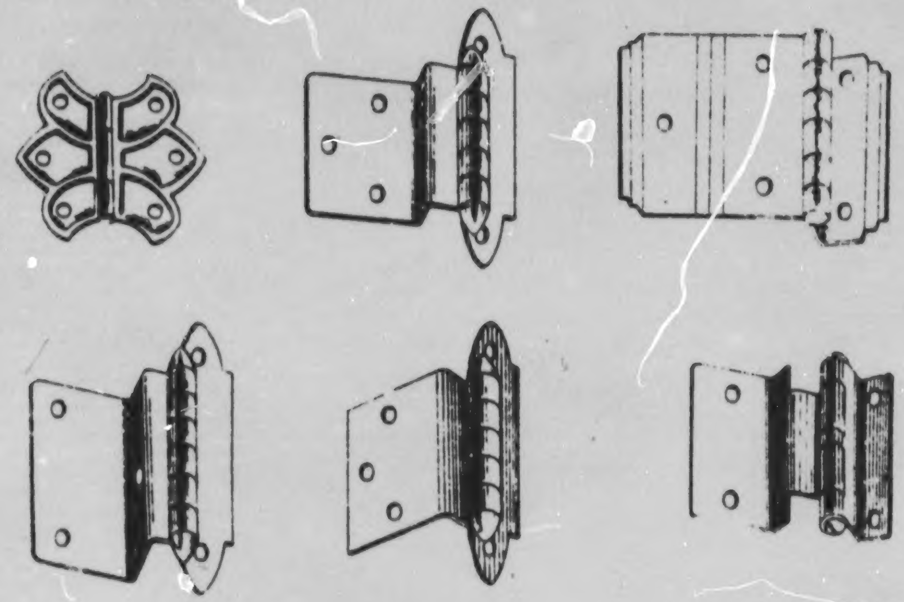


Figure 40. Cabinet Hinges

Door and Window Hardware

Door and window hardware is available in a great variety of types, styles, sizes, and finishes. We will discuss knobs, pulls, handles, catches, latches, locksets, door holders, doorstops, miscellaneous door hardware, overhead door hardware, sliding door hardware, folding door hardware, and window and screen hardware.

KNOBS. Figure 41 shows several different shaped cabinet knobs which are available in a number of sizes and finishes that match the cabinet hinges previously discussed. The backplates shown are used to serve as protection against fingers marring the wood surface.

HANDLES. Figure 42 illustrates some of the handles used in woodworking. The ring-type handle for sliding doors fits into a mortise in the edge of the door and is used to pull the door out of its recessed opening. The remainder of the handles shown are utility-type handles used on rough-type finishes.

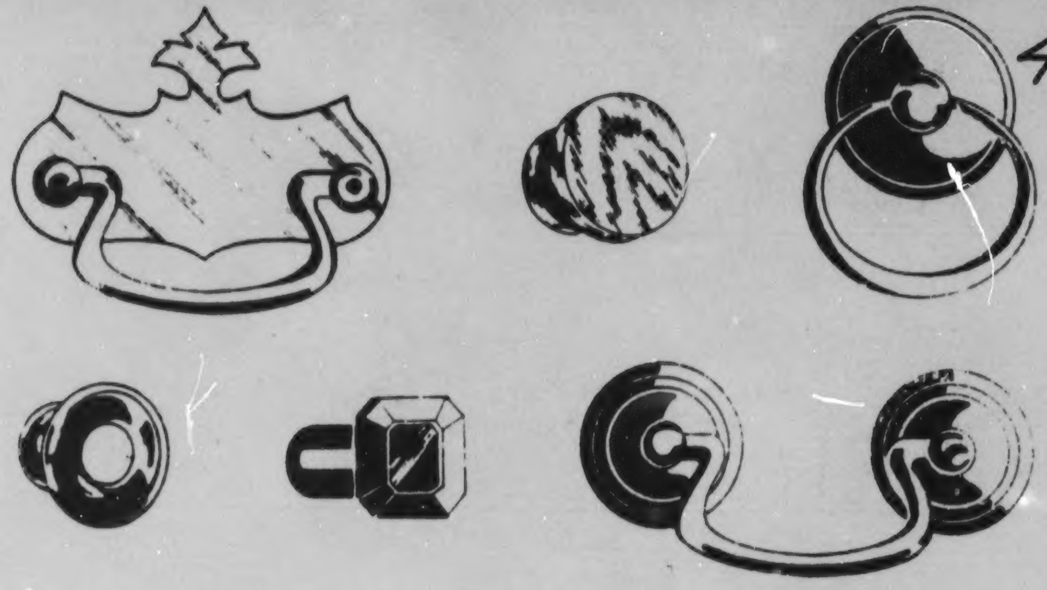


Figure 41. Knobs

CATCHES. Figure 43 shows a group of catches used on cabinet doors. All are self-releasing when the door is pulled, except the elbow catch which must be released by hand.

LATCHES. Figure 44 illustrates several latches and bolts used on doors, windows, and gates. Latches are used on a unit to hold it in place when closed.

KNOBS AND LOCKSETS. Figure 45 shows some of the various types of common doorknobs and locksets. The mortise-type lockset are made for passage without the key and lockbar as well as with the locking provisions.

Mortise locks are difficult to install because of the deep mortise that must be cut.

The rim-type lockset is only used for locking provisions and will have a knobset in conjunction with it.

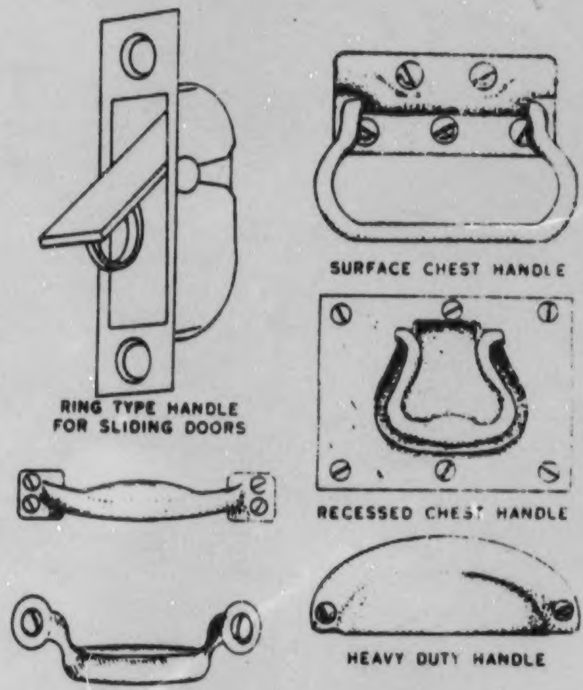
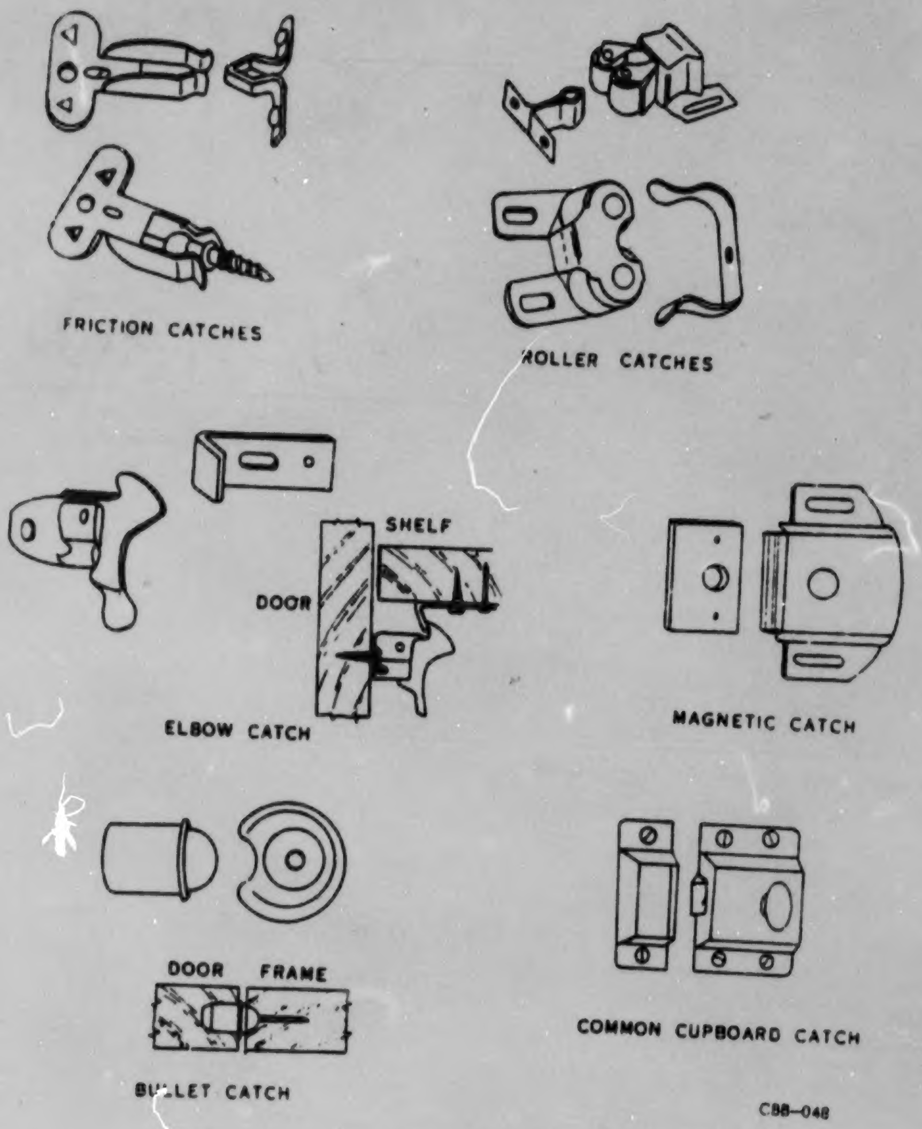

SURFACE CHEST HANDLE
RING TYPE HANDLE FOR SLIDING DOORS
RECESSED CHEST HANDLE
HEAVY DUTY HANDLE
GATE HANDLES
CBB—316

Figure 42. Handles



FRICTION CATCHES

ROLLER CATCHES

ELBOW CATCH

MAGNETIC CATCH

BULLET CATCH

COMMON CUPBOARD CATCH

SHELF
DOOR
DOOR
FRAME
C88-048

Figure 43. Catches

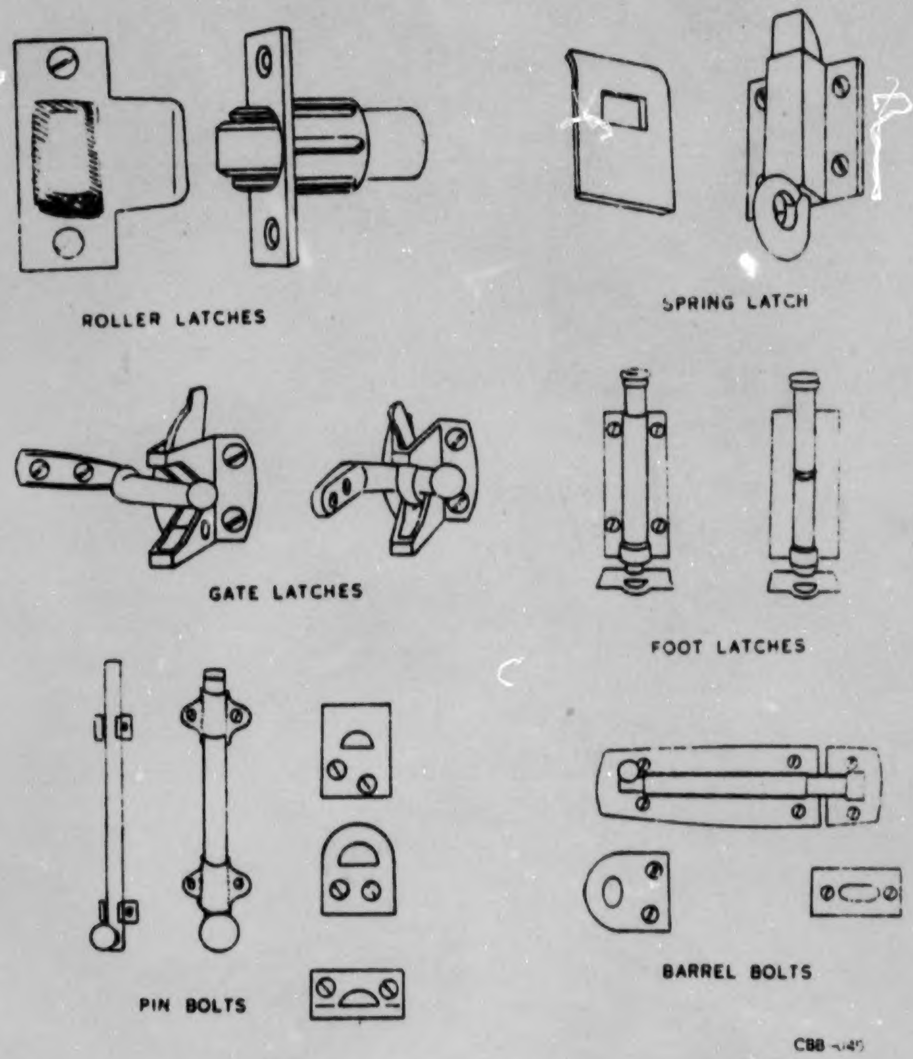

ROLLER LATCHES
SPRING LATCH
GATE LATCHES
FOOT LATCHES
PIN BOLTS
BARREL BOLTS
CBB

Figure 44. Latches and [illegible]

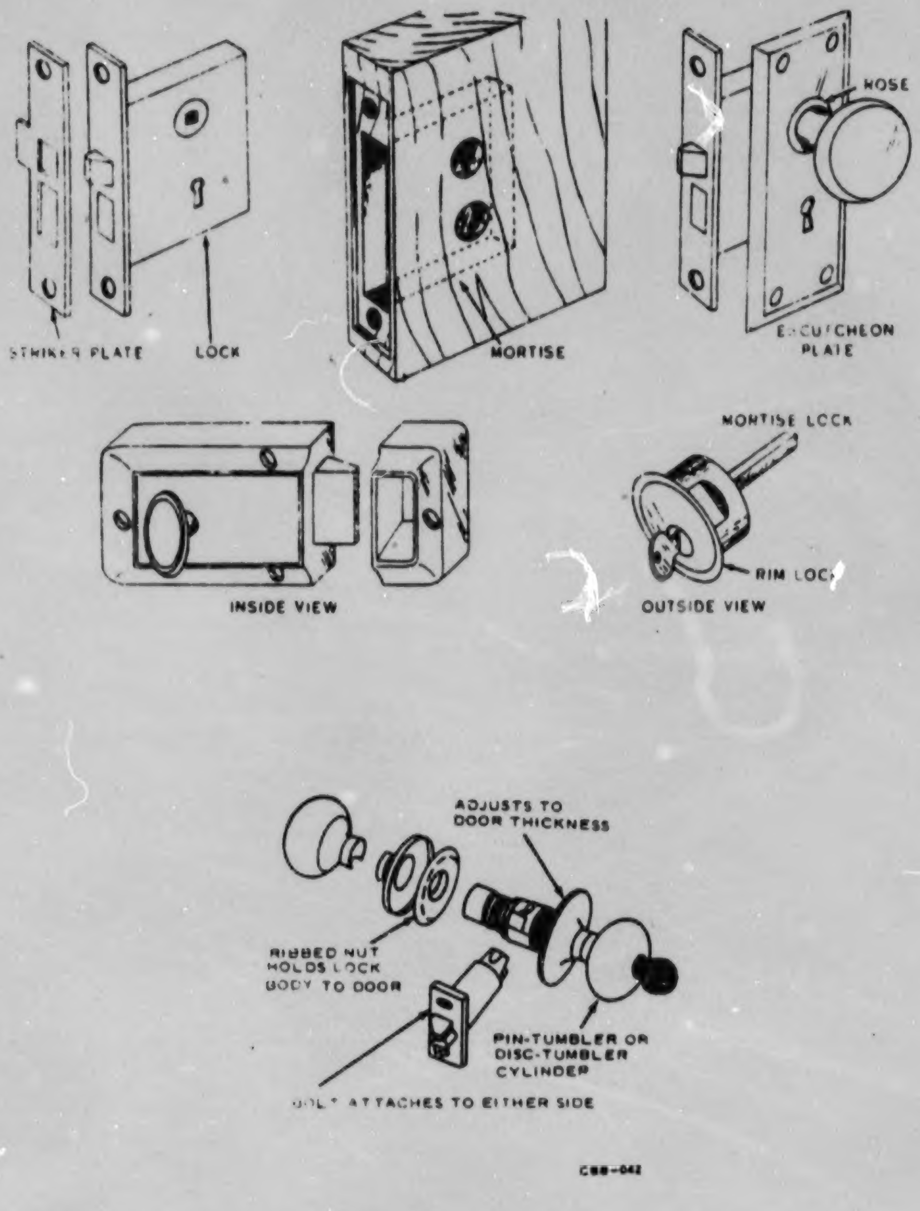

STRIKER PLATE
LOCK
MORTISE
ROSE
ESCUTCHEON PLATE
MORTISE LOCK
INSIDE VIEW
RIM LOCK
OUTSIDE VIEW
ADJUSTS TO DOOR THICKNESS
RIBBED NUT HOLDS LOCK BODY TO DOOR
PIN-TUMBLER OR DISC-TUMBLER CYLINDER
BOLT ATTACHES TO EITHER SIDE
C88-042

Figure 45. Locksets

The most commonly used lockset is the cylinder lockset. There are several variations of this unit including: the key-in-knob unit shown in figure 45, the passage knob-set without any locking device, and the privacy lockset used for bathroom and bedroom doors. The cylinder lockset is easily installed by drilling a large hole through the door surface and another through the edge of the door.

FIRE EXIT BOLTS. This device is designed to be used on single or double doors in buildings, where the doors open outward for exit in case of fire. Many Air Force buildings are equipped with this type hardware. Figure 46 illustrates a fire exit door without a mullion. The inside bar and bolt shown with the top and bottom latches can be opened from the inside only by pushing the bar. The inside bar and bolt with the center latch is opened from the inside by the bar and from the outside by a handle having a knob or thumb latch.

DOOR HOLDERS AND DOORSTOPS. Figure 47 shows door holder and doorstops used by the carpenter. The door holder is designed to hold a door in any position. Doorstops are used to stop door travel at a desired opening. This reduces damage to doors, walls, and furniture.

MISCELLANEOUS DOOR HARDWARE. Figure 48 illustrates several units of miscellaneous door hardware. The door check and closer is designed to stop door travel at a desired opening and also to force the door to close at a regulated speed thus reducing damage to the door and frame.

The safety chain shown limits door-open travel and reduces opening shock.

The chain fastener installed on the inside of a door allows the door to be opened slightly without unlocking the door completely.

OVERHEAD DOOR HARDWARE. Figure 49 illustrates one type of overhead door hardware. The top edge of the door rolls back on rollers in an overhead channel. The balance spring compensates for the door weight.

Another type is the roll-up sectional door which has a curved roller track and the door sections are hinged to each other.

SLIDING DOOR HARDWARE. Figure 50 shows sliding door hardware which allows a door to slide to one side instead of hinging in or out.

Heavy doors for airplane hangars, garages, or barns are sometimes mounted on rollers and channels rather than hinges. This makes them sliding instead of swinging doors and eliminates the possibility of sagging. There are many different types of sliding door assemblies available. Some are very small for light closet doors or very large for heavy hangar doors. The type of sliding door assembly will depend on the type of construction and purpose of the building.

FOLDING DOOR HARDWARE. Figure 51 shows a folding door with hardware. This type installation pivots one door at the top and bottom on one edge. When opening or closing, the opposite door is guided in the upper track by a suspended guide.

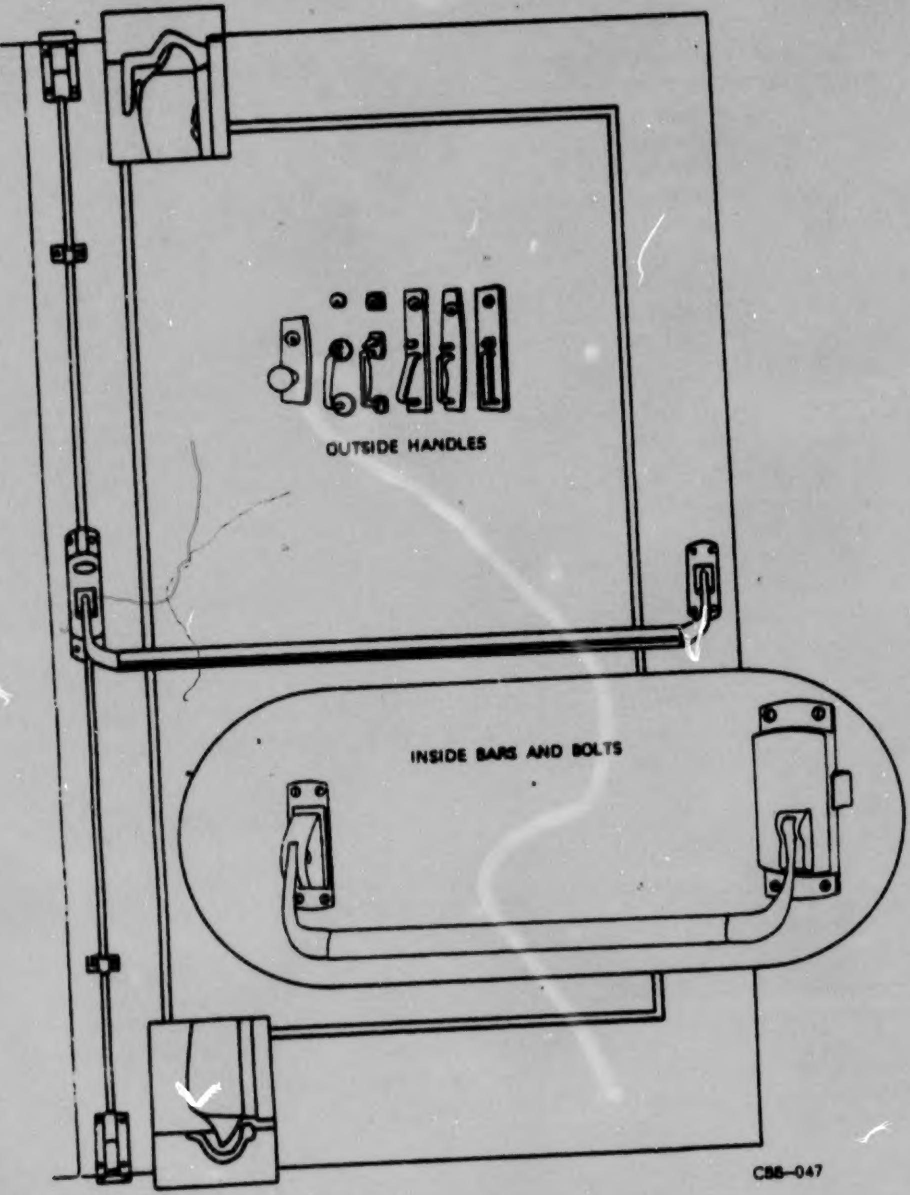

OUTSIDE HANDLES
INSIDE BARS AND BOLTS
CBB-047

Figure 46. Fire Exit Bolts

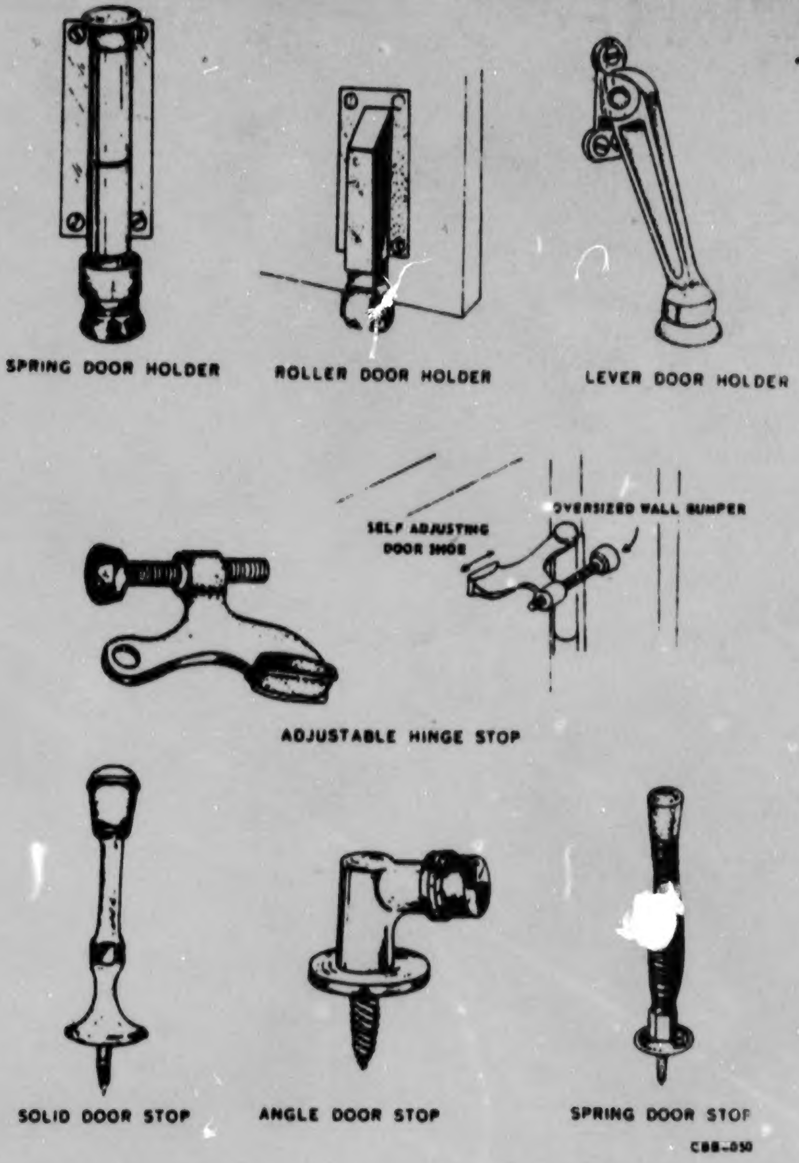
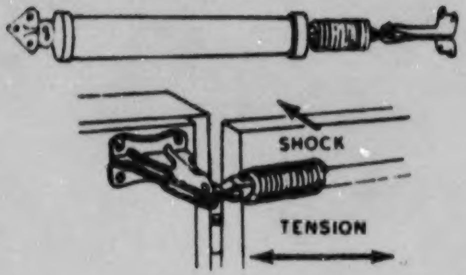
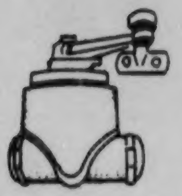

SPRING DOOR HOLDER
ROLLER DOOR HOLDER
LEVER DOOR HOLDER
SELF ADJUSTING DOOR SHOE
OVERSIZED WALL BUMPER
ADJUSTABLE HINGE STOP
SOLID DOOR STOP
ANGLE DOOR STOP
SPRING DOOR STOP
CBB-050

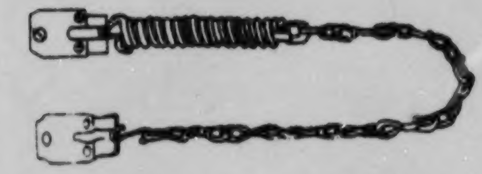
Figure 47. Door Holders and Stops



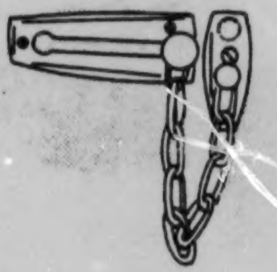
SCREEN AND STORM DOOR
CHECK AND CLOSER



ENTRANCE DOOR
CHECK AND CLOSER



SCREEN AND STORM DOOR SAFETY CHAIN



CHAIN DOOR FASTENER

CBB-051

Figure 48. Miscellaneous Door Hardware

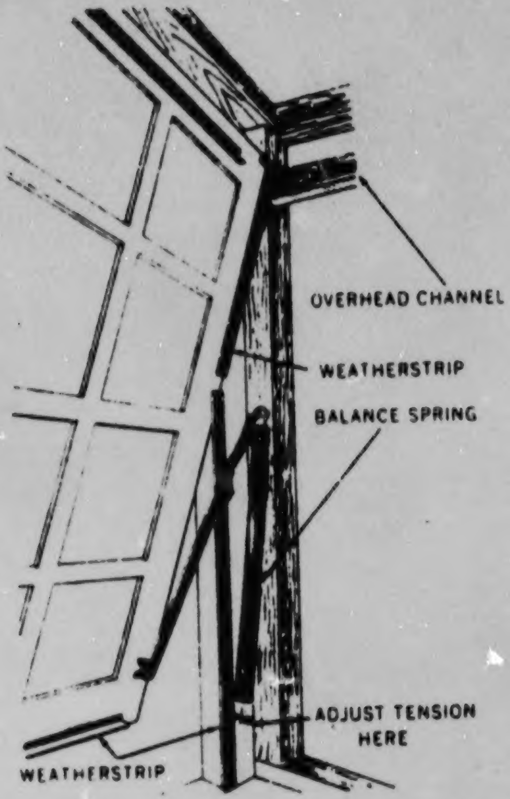

OVERHEAD CHANNEL
WEATHERSTRIP
BALANCE SPRING
ADJUST TENSION HERE
WEATHERSTRIP

Figure 49. Overhead Door Hardware

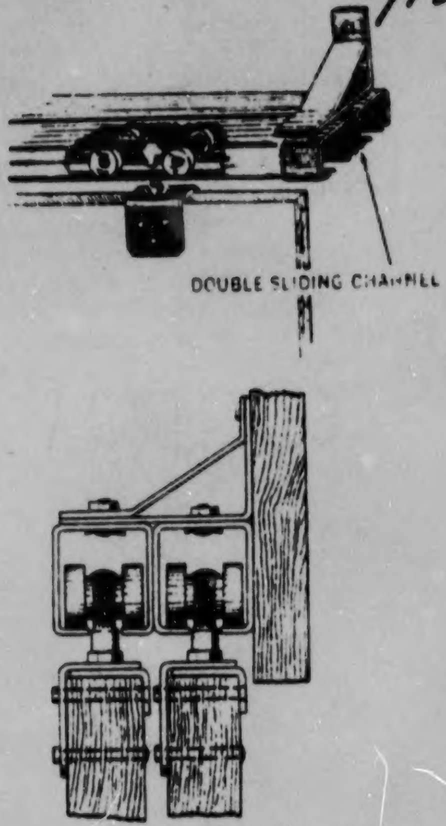

DOUBLE SLIDING CHANNEL

Figure 50. Sliding Door Hardware

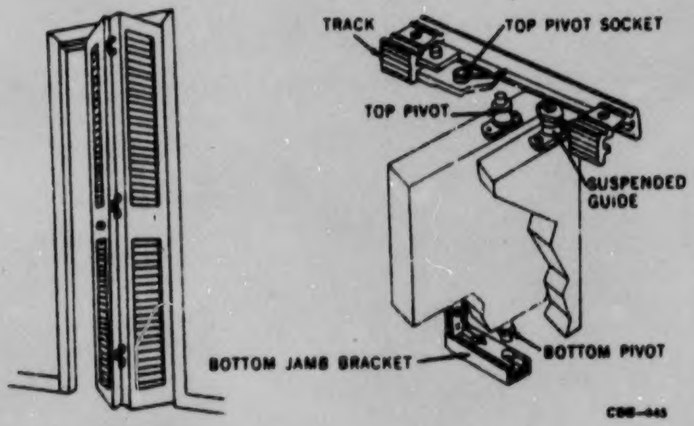

TRACK
TOP PIVOT SOCKET
TOP PIVOT
SUSPENDED GUIDE
BOTTOM JAMB BRACKET
BOTTOM PIVOT
CBB-045

Figure 51. Folding Door and Hardware

WINDOW AND SCREEN HARDWARE. Figure 52 illustrates various window and screen hardware. The sash lift or bar sash lift are placed on the bottom of the lower sash to give a lifting handle for raising the sash. The sash lock is placed between the upper and lower sash on a double hinge window and secures them together thus stopping the raising of the lower sash and the lowering of the upper sash. Button fasteners are used to secure some types of screens. The surface screen and sash hanger shown is used to hang wooden screen or wooden storm sash frames. This type fitting allows for easy removal and replacement of the unit. The hook and eye is used for fastening two units together such as holding screen doors closed and securing the bottom of window screens or storm sash.

Miscellaneous Hardware

Figure 53 shows several items of miscellaneous hardware. This is by no means a complete listing of all miscellaneous items of hardware.

Combination shelf and closet pole bracket. This item is used to support a clothes closet shelf and a clothes hanging pole.

SHELF BRACKET AND SUPPORTS. The shelf bracket shown is a stationary bracket used to carry the weight of a shelf and its contents. The adjustable shelf support is used mainly in bookshelves where it is desirable to adjust the height of the shelf.

JOIST HANGER. This item is made of steel and is used to give additional support to the end of a floor joist where it connects to a header joist.

METAL BRIDGING. This is an item that is fitted in pairs from the bottom of one floor joist to the top of adjacent joist and crossed to distribute floor loads.

HANDRAIL BRACKET. This item is made of steel and is used to fasten stair handrails to the wall.

IRONS. Flat, T-, and inside corner irons are used to reinforce wood joints and corners. They come in various sizes and finishes.

HAT AND COAT HOOK. This item comes in a number of styles, sizes, and finishes and is used as a clothing hanger.

SUMMARY

All woods are classified as hardwoods and softwoods, but this is a relative term that refers to a tree shedding its leaves, rather than the actual hardness of the wood.

The common woods are those that are used because of general acceptance or availability.

Plywoods are made up of thin layers of wood glued together. The type of wood and type of glue determines whether the plywood can be used outside or inside.

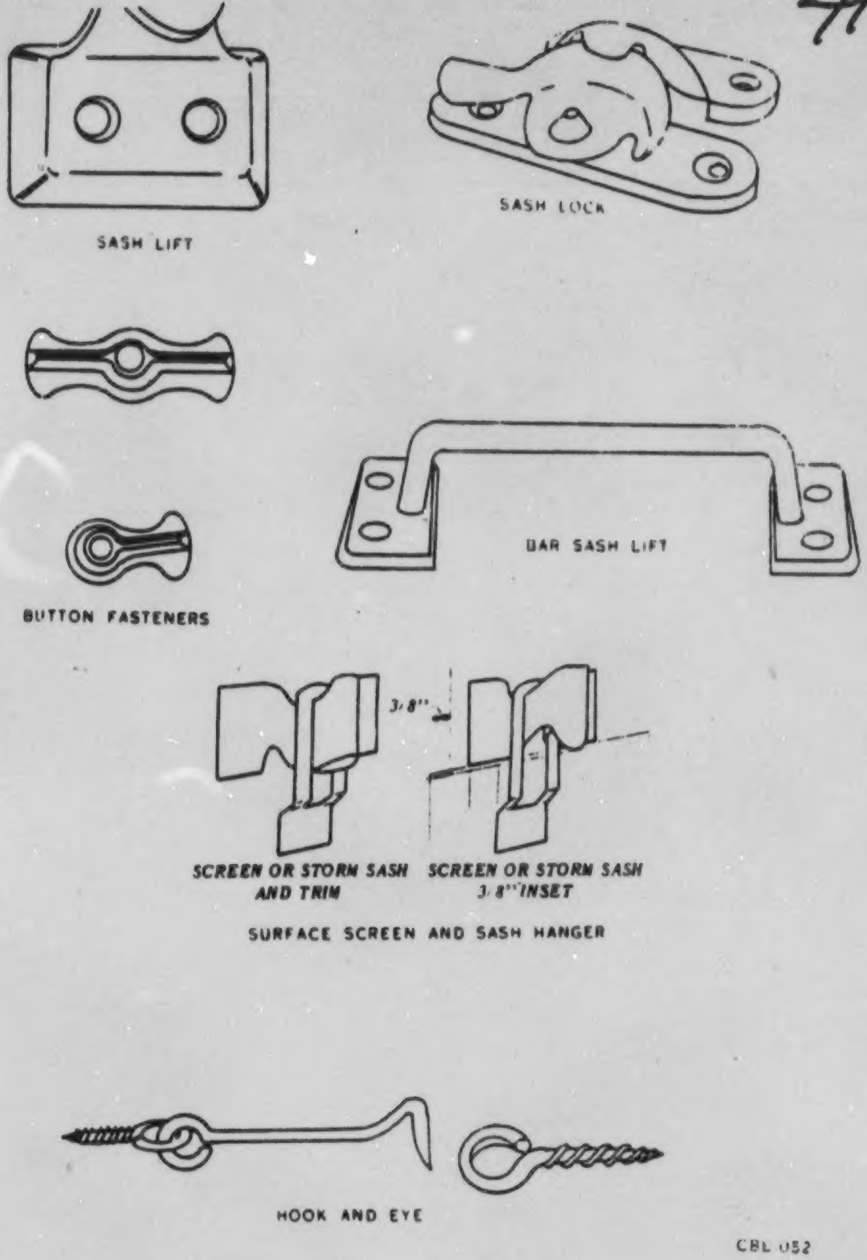

SASH LIFT
SASH LOCK
BUTTON FASTENERS
BAR SASH LIFT
3/8"
SCREEN OR STORM SASH AND TRIM
SCREEN OR STORM SASH 3/8" INSET
SURFACE SCREEN AND SASH HANGER
HOOK AND EYE
CBL 052

Figure 52. Window and Screen Hardware

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Lumber sizes are listed as nominal size and dressed dimensions. Dressed lumber is always smaller because it has been smoothed for easier handling.

Hardware is divided into two main classes: rough and finish.

Rough hardware includes nails, screws, bolts, and anchors. This type of hardware is not normally seen in the finished product.

Nails are made in many different sizes and various shapes of heads, points, and shanks; each type is designed for a particular purpose depending upon the nature of the work, the kind of wood into which they are to be driven, and the holding power required.

Screws are used for fastening finish hardware, trim members, and cabinet construction. Because of their great holding power they are superior to nails. They are decorative and are easily removed. However, the use of screws is often discouraged because of the time involved to install them and the cost factor.

Metal trim and metal prefabricated building necessitates the use of metal fastening devices such as sheet metal screws and bolts. The carpenter must be familiar with these items to be able to install metal trim and erect metal buildings.

Finish hardware is any hardware that is decorative and/or functional such as hinges, knobs, pulls, catches, latches, locks, etc. Each of these devices are available in many sizes, shapes, finishes, and design. The type of hardware used on any particular job depends upon the choice of the building and/or the requirements of the building.

QUESTIONS

1. The pine tree has needle-type leaves; what is the classification of its wood?
2. Name four common hardwoods.
3. Name four common softwoods.
4. Name three woods used for dowels.
5. Which wood is most popular as flooring?
6. There is a wood that feels oily; which one is it?
7. Why does plywood always have an odd number of plies?
8. How can a piece of plywood be recognized for interior or exterior use?
9. What does the designation S4S mean?
10. Lumber grades are divided into two major types according to quality; what are they?

11. How is hardware classified?

12. How are sizes and weights of nails indicated?

13. What is the purpose of a duplex-headed nail?

14. How are nails treated to reduce corrosion?

15. What is the abbreviation for the nail size, PENNY?

16. What are the different types of wood screws?

17. What are the advantages of using screws?

18. Where are carriage bolts used?

19. What is the purpose of sheet metal screws?

20. What are three types of butt hinges?

21. How is an elbow catch released?

22. Name the three types of locksets?

BUILDING MATERIALS

OBJECTIVES

When you have completed this workbook you will be able to

Select the proper type wood for a specific job.

Match a description of plywood with a picture of the backstamp.

Match nominal lumber sizes with actual dressed dimensions.

Match lumber grades with grade descriptions.

Identify building hardware as to type, size and use.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-I-8	1/student
Wood Types, Identification Board	1/12 students
Examples of Plywood	1/student

PROCEDURE

Mission 1

Select the proper type wood for a specific job.

Listed below are several woods that you will be using.

Oak	Redwood	Yellow Pine	Philippine Mahogany
Birch	Cedar	White Pine	Douglas Fir

Uses	Wood
1. Floors, interior finish and furniture	________
2. Interior and exterior trim, sashes, doors	________
3. Used in framing	________
4. Studding, joist, cheap flooring	________
5. Shingles, siding, utility poles	________
6. Quality furniture, cabinets, interior trim	________
7. Siding, fences, water cooling towers	________
8. Paneling, boat building, plywood core	________

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Mission 2

Match the description of plywood with a picture of the backstamp.

On the next page you will find eight backstamps, as found on some plywoods, you are to read the description below and place the description number under the identified backstamp.

1. Used where the appearance of only one side is important, such as siding and fences.

2. Used for concrete forms, has a high reuse factor, has red painted edges.

3. This is an outdoor utility panel, for boxcar, truck linings and work buildings.

4. Used as a base for tile floors and carpeting, where unusual moisture conditions exist, such as a bathroom, utility room, and kitchen.

5. Used for interior work where appearance of only one side is important, such as built-ins, paneling, shelving and partitions.

6. Interior utility panel used where one side is required, good for backing, sides of built-ins, separator boards, and bins.

7. Combination subfloor and underlaying. Base for finish flooring. Available in square edges or with tongue and groove sides or sides and edges.

8. Unsanded grade with waterproof bond. Used for sheathing with recommended support spacing indicated.

Mission 2

Match the description of plywood with a picture of the backstamp.

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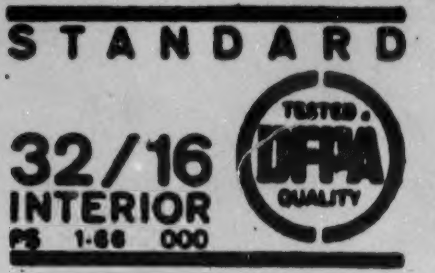
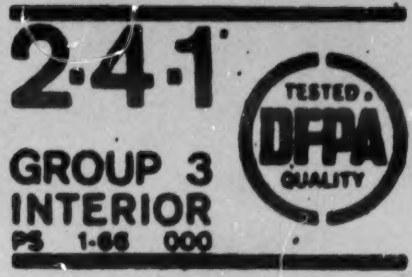
7. Combination subfloor and underlaying. Base for finish flooring. Available in square edges or with tongue and groove sides or sides and edges.

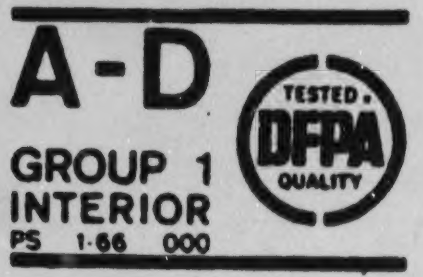
8. Unsanded grade with waterproof bond. Used for sheathing with recommended support spacing indicated.


STANDARD
32/16
INTERIOR
PS 1-66 000
TESTED
DFPA
QUALITY

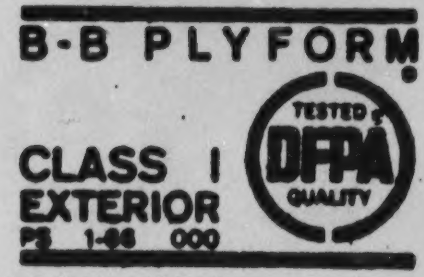
Description Number ________


2·4·1
GROUP 3
INTERIOR
PS 1-66 000
TESTED
DFPA
QUALITY

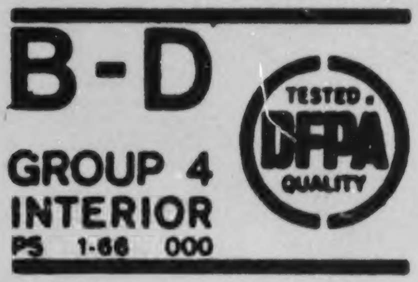
Description Number ________


A-D
GROUP 1
INTERIOR
PS 1-66 000
TESTED
DFPA
QUALITY

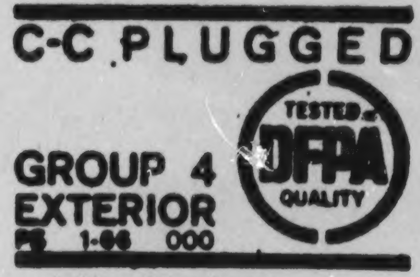
Description Number ________


B-B PLYFORM
CLASS I
EXTERIOR
PS 1-66 000
TESTED
DFPA
QUALITY

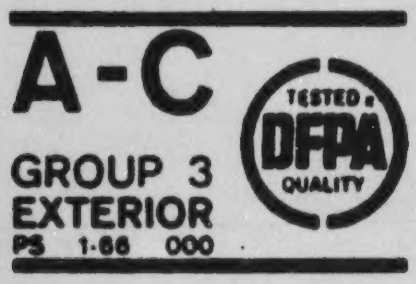
Description Number ________


B-D
GROUP 4
INTERIOR
PS 1-66 000
TESTED
DFPA
QUALITY

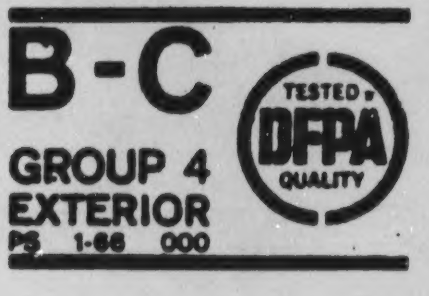
Description Number ________


C-C PLUGGED
GROUP 4
EXTERIOR
PS 1-66 000
TESTED
DFPA
QUALITY

Description Number ________


A-C
GROUP 3
EXTERIOR
PS 1-66 000
TESTED
DFPA
QUALITY

Description Number ________


B-C
GROUP 4
EXTERIOR
PS 1-66 000
TESTED
DFPA
QUALITY

Description Number ________

Mission 3

Match lumber nominal sizes with the actual dressed dimensions.

Select lumber nominal sizes from the following list and write them in the blanks provided next to the corresponding actual dressed dimensions.

1 x 2
1 x 3
1 x 4
1 x 6
1 x 8
1 x 10
1 x 12
2 x 4
2 x 6
2 x 8
2 x 10
2 x 12

Actual Dressed Dimensions	Nominal Size
1 1/2 x 11 1/2 =	
3/4 x 11 1/2 =	
1 1/2 x 5 1/2 =	
3/4 x 2 1/2 =	
3/4 x 9 1/2 =	
1 1/2 x 3 1/2 =	
3/4 x 5 1/2 =	
1 1/2 x 7 1/2 =	
3/4 x 1 1/2 =	
1 1/2 x 9 1/2 =	
3/4 x 7 1/2 =	
3/4 x 3 1/2 =	

Mission 4

Match common lumber grades with a description of each.

1. Select from the following list the common lumber grade that matches each of the following descriptions.

2. Write the grade in the space provided next to the corresponding description.

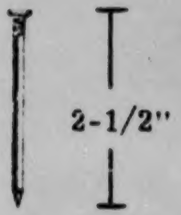
No. 1 Common
No. 2 Common
No. 3 Common
No. 4 Common
No. 5 Common

Description	Grade
Contains a limited number of significant, but no knotholes or serious defects. It must be suitable for use as graintight lumber.	
Low-quality material, contains serious defects like knotholes, checks, shakes and decay.	
Suitable for use without waste, contains only a few minor defects. Sound, tight knotted stock and must be suitable for use as graintight lumber.	
Not produced in some species. Must be usable and capable of holding together under normal handling.	
Permits some waste. Contains a few defects, such as occasional knotholes.	

Mission 5

1. Identify nail types and sizes.

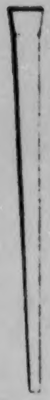
a.



Type ____________

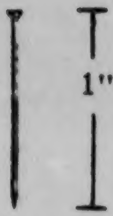
Size ____________

b.



Type ____________

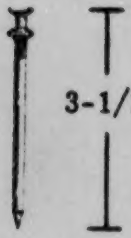
c.



Type ____________

Size ____________

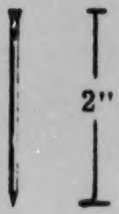
d.



Type ____________

Size ____________

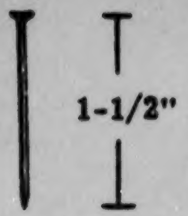
e.



Type:

____

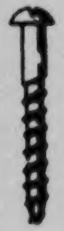
Size: ________

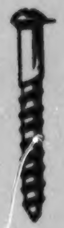
f. 

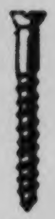
Type ______________________

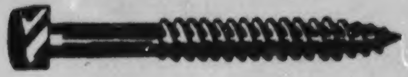
Size ______________________

2. Identify types of screws.

a.  ______________________

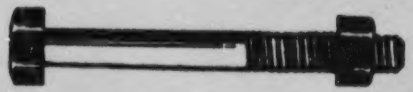
b.  ______________________

c.  ______________________

d. 

____

3. Identify types of bolts.

a. 

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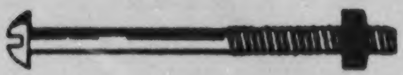
b. 

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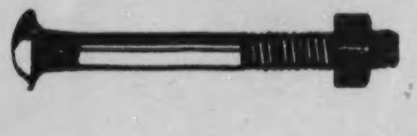
c. 

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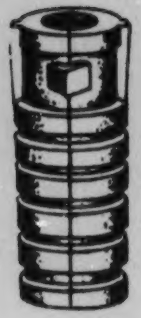
d.



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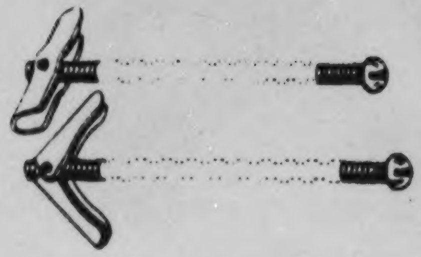
e.



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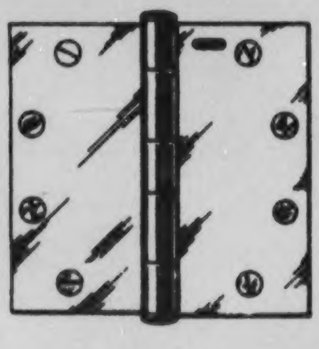
4. Identify types of hinges.

a.



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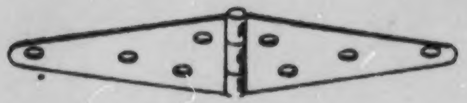
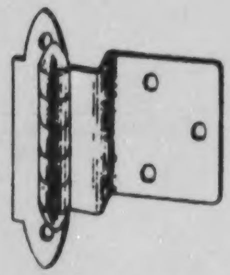
b.



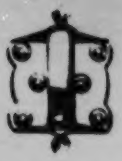
____

c.



____

d.



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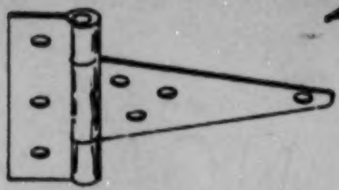
e.



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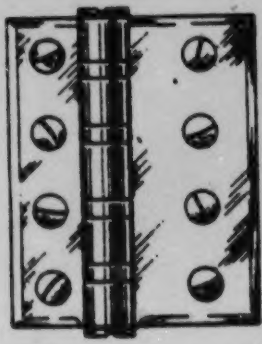
f.



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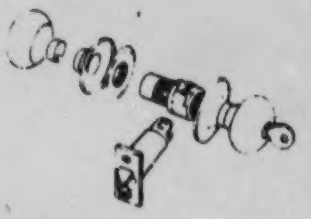
5. **Identify types of locksets.**

a.



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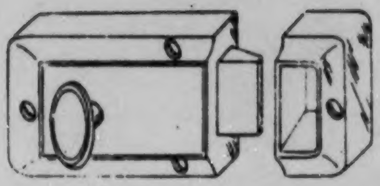
b.



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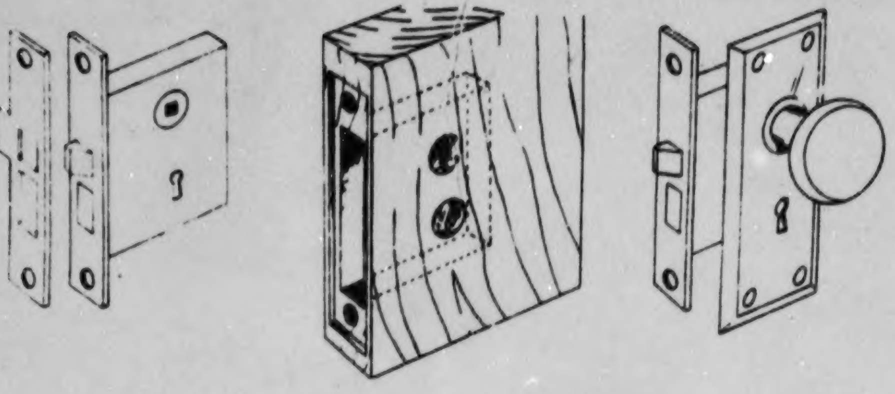
427

c.



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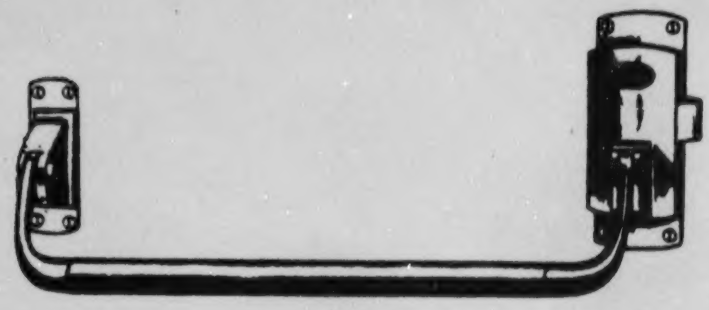
d.



434

INTERPRETING DRAWINGS

OBJECTIVE

This study guide will familiarize you with drawings, drawing tools, specifications, schedules, and symbols.

INTRODUCTION

The entire story of construction projects can be read in the lines, symbols, notes, and specifications of the construction drawings for a job. Because of this, it is necessary that you be able to read and interpret these drawings.

Drawings are divided into two general classes: primary drawings, which consist of design sketches and drawings for display purposes; and construction drawings, which consist of views (flat surface line drawings) giving detailed information necessary for actual construction of the building. The construction of a building is described by a set of drawings which gives a thorough graphic description of each part of the operation. Usually, a set of plans begins by showing the boundaries, contours, and outstanding features of the construction site. Succeeding drawings give instructions for erecting the foundation and superstructure; installation of lighting, heating, and plumbing; and details of construction required to complete the building.

Items covered in this study guide are:

- DRAWING DETAILS
- SYMBOLS
- COMMON ABBREVIATIONS
- DRAWING DETAILS
- BASIC DRAWING TOOLS
- CONSTRUCTION DRAWINGS

DRAWING DETAILS

The titles placed on drawings are very important. When they are placed on a drawing, they will be strategically placed to clearly refer to the part, detail, or view which they identify. Titles for rooms will stand out clearly near the center of the area. Titles for detail views will be carefully placed for easy reading and correctly identified according to the reference system being used throughout the set of plans.

The blueprint method of reproduction has been so widely used that plans of all types are now quite often called blueprints. The blueprint is the builder's guide. It is a complete diagrammatic sketch, with dimensions, of a structure to be built and contains most of the information needed by the builder. All builders must know how to read blueprints and build by them. The blueprint, as used by the builder, is made up of different types of lines showing various views with a scale and legend. Study some of the illustrations on the previous pages and note the different kinds of lines. Let's see what these lines are.

Extension Lines

It may sometimes be necessary to lengthen or extend working lines on a drawing. These lengthening lines are known as extension lines. As shown in figure 54, the end of an extension line should never join the working line which it extends.

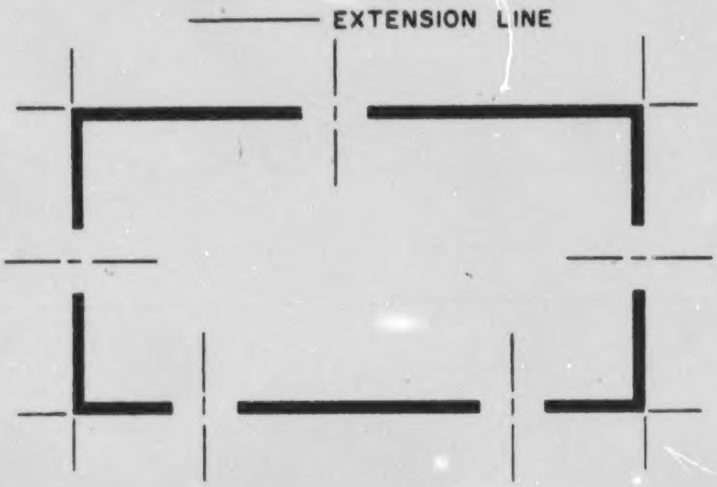


Figure 54. Extension Lines

Dimension Lines

Dimension lines are usually located between extension lines, and dimensions are given in feet and inches. The numerals are placed slightly above or in the dimension line with the reading position from the bottom and right-hand edge of the sheet. The main requirement is that dimensions be clear, definite, and unmistakable. Figure 55 shows how fractions, inches, feet, and combinations of these are specified on plans or drawings.

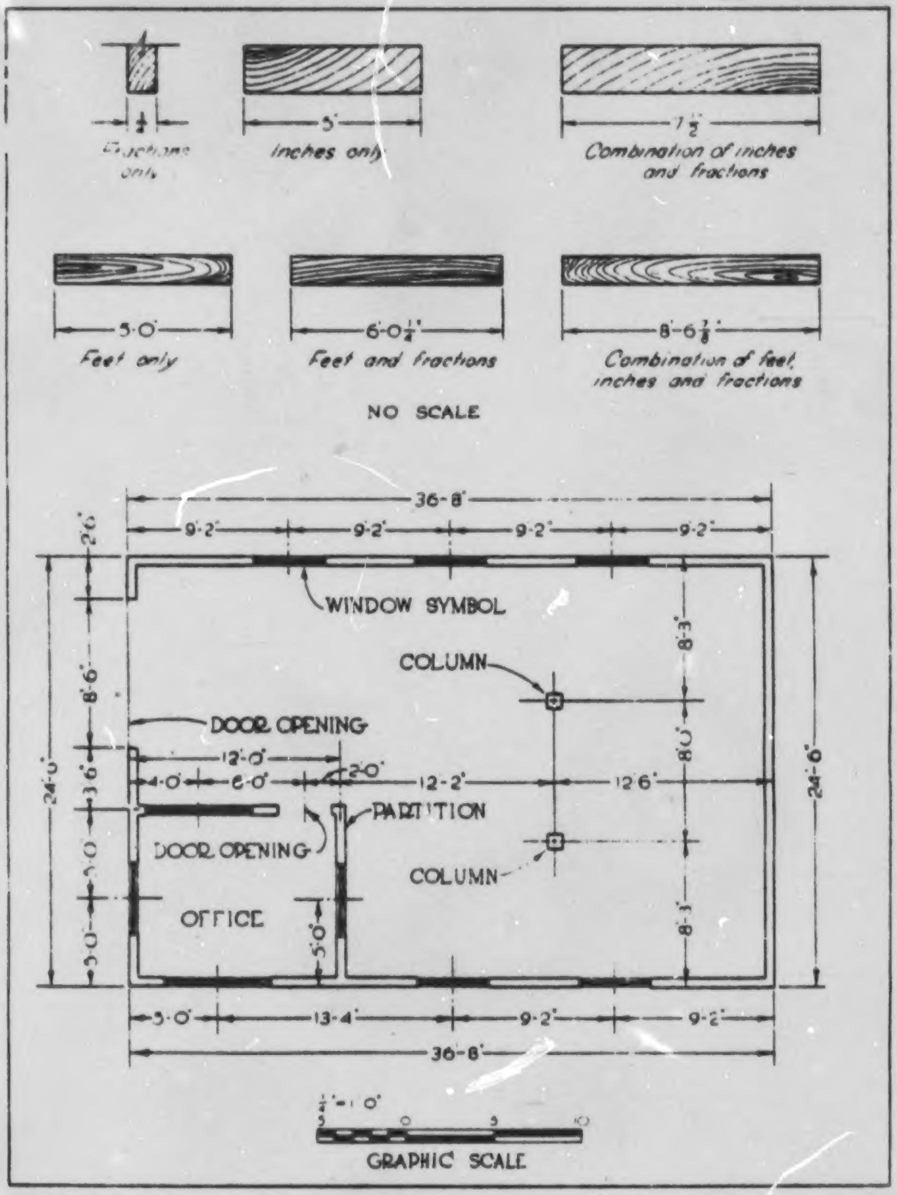

$\frac{1}{4}$"
Fractions only
5"
Inches only
$7\frac{1}{2}$"
Combination of inches and fractions
5'-0"
Feet only
$6'-0\frac{1}{4}$"
Feet and fractions
$8'-6\frac{7}{8}$"
Combination of feet, inches and fractions
NO SCALE
36'-8"
9'-2"
9'-2"
9'-2"
9'-2"
2'-6"
WINDOW SYMBOL
COLUMN
8'-3"
8'-6"
DOOR OPENING
12'-0"
4'-0"
6'-0"
2'-0"
12'-2"
12'-6"
8'-0"
3'-6"
24'-0"
24'-6"
PARTITION
DOOR OPENING
COLUMN
OFFICE
5'-0"
5'-0"
8'-3"
5'-0"
13'-4"
9'-2"
9'-2"
36'-8"
$\frac{1}{4}$" = 1'-0"
5
0
5
10
GRAPHIC SCALE

Figure 55. Dimensioning

Working Lines

The lines which represent the edges of surfaces, as shown in figure 56 are somewhat heavier than the other lines on the drawing and are known as working lines. These lines may be straight or curved, depending upon the shape and view of the object.

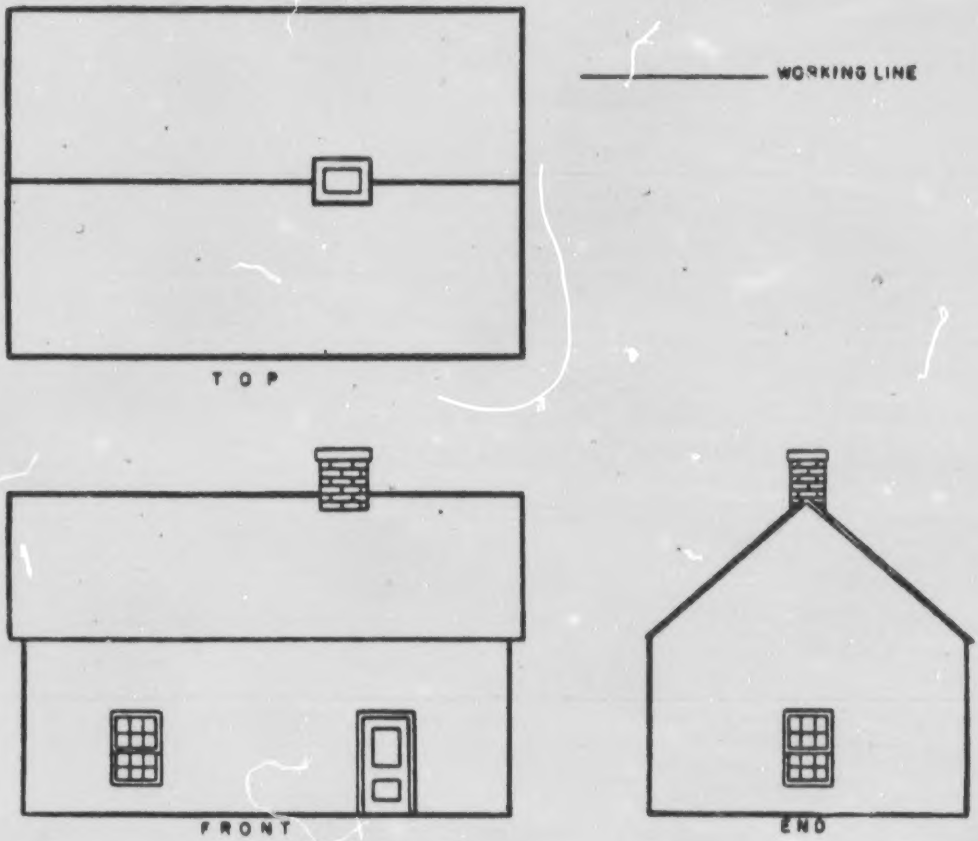


Figure 56. Three Views Showing Working Lines

Hidden Lines

An outline of an object edge which is invisible in the particular view is known as a hidden line and is represented by a series of short dashes, approximately 1/8 inch in length, as shown in figure 57. The space between dashes is about equal to the width of the line.

432

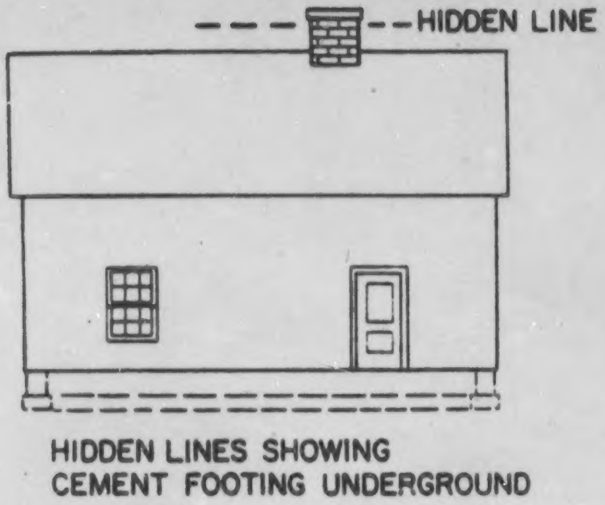

HIDDEN LINE
HIDDEN LINES SHOWING
CEMENT FOOTING UNDERGROUND

Figure 57.

Centerlines

Centerlines, as shown in figure 58, indicate the center of an object. They are also used to show the center of holes or openings in objects and curved portions.

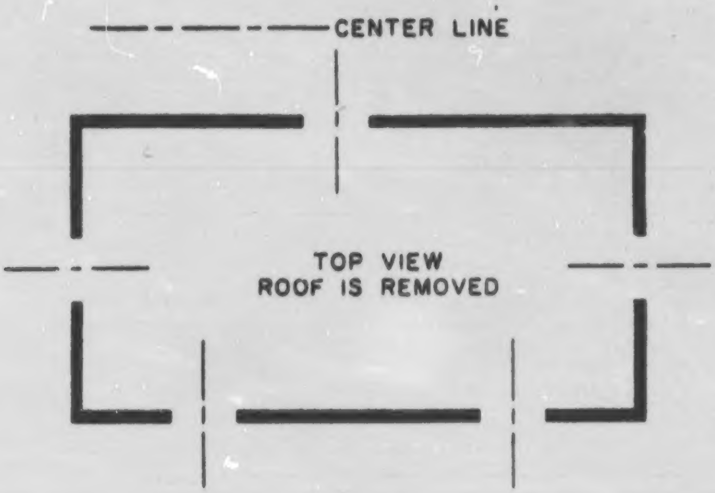
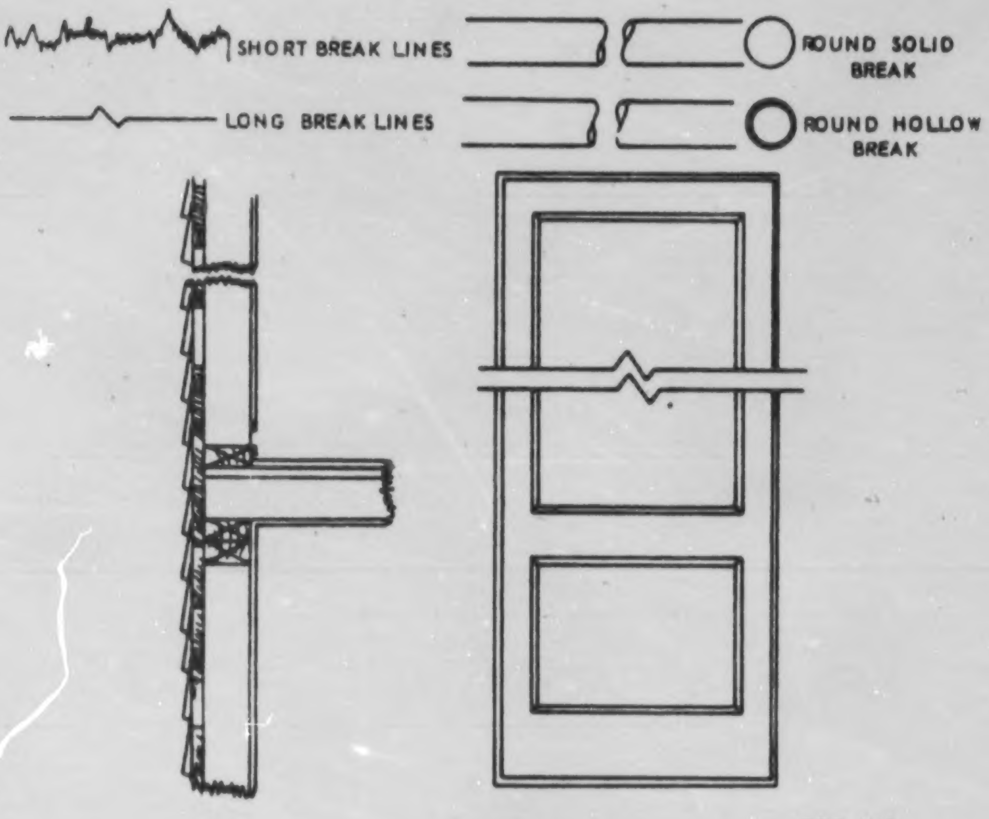

CENTER LINE
TOP VIEW
ROOF IS REMOVED

Figure 58

Breaklines

Two kinds of breaklines are used. One kind indicates short breaks and the other indicates long breaks, as illustrated in figure 59. The short break line is drawn freehand. A ruled line with occasional freehand zig-zags is used for long breaks. Breaklines indicate that an object continues without change in detail. Only a short portion of the entire object is represented when break lines are used. The method of indicating breaks in round solid and round hollow shapes is also shown in figure 59.



CDB-043

Figure 59. Breaklines

SYMBOLS

Architectural symbols are used to simplify the drawing. In order to read and understand blueprints, you must be able to recognize and interpret these symbols. Some of the more common symbols are shown in figures 60, 61, 62, and 63. See how many of them look like what they represent.

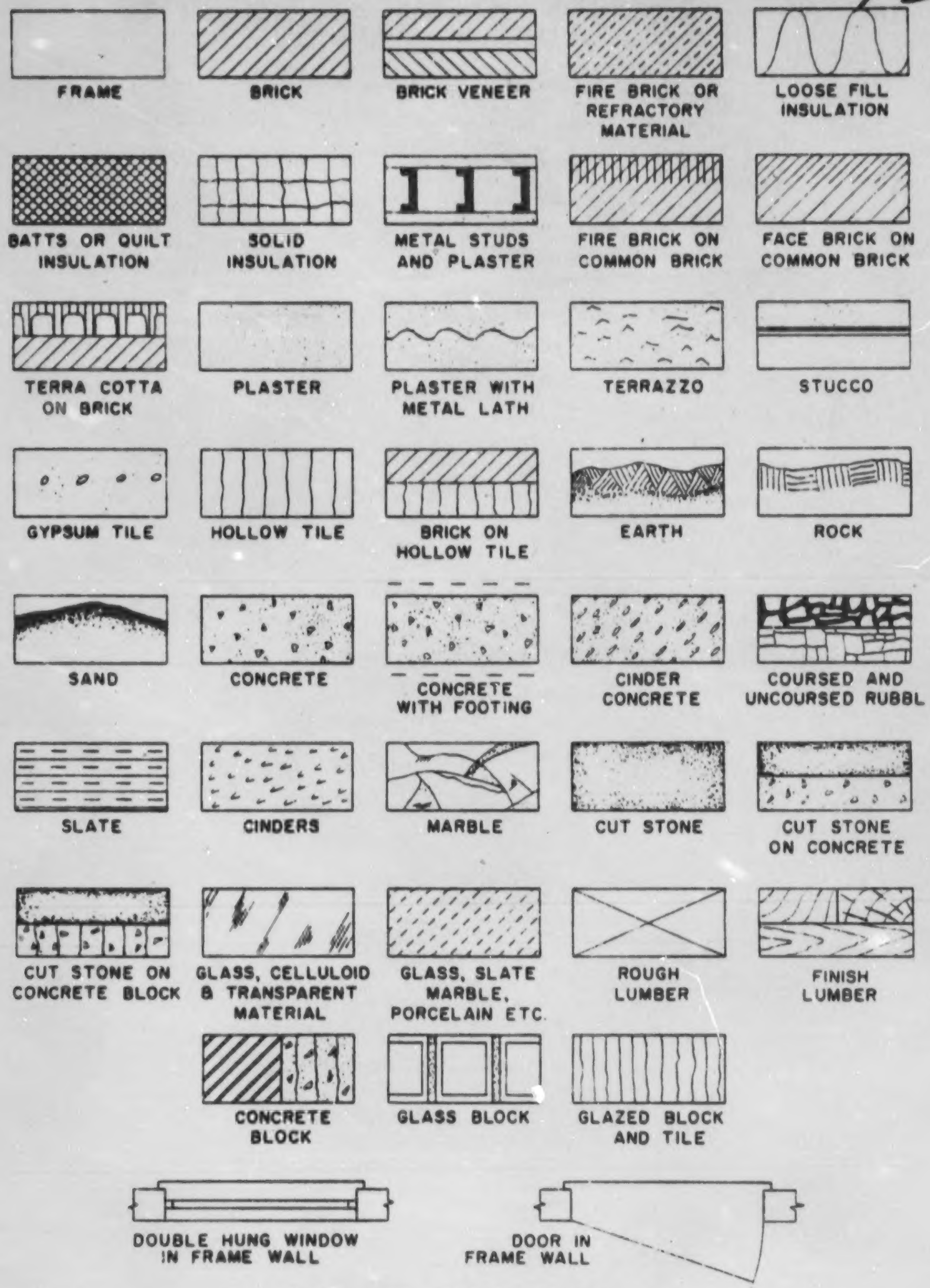

FRAME
BRICK
BRICK VENEER
FIRE BRICK OR REFRACTORY MATERIAL
LOOSE FILL INSULATION
BATTS OR QUILT INSULATION
SOLID INSULATION
METAL STUDS AND PLASTER
FIRE BRICK ON COMMON BRICK
FACE BRICK ON COMMON BRICK
TERRA COTTA ON BRICK
PLASTER
PLASTER WITH METAL LATH
TERRAZZO
STUCCO
GYPSUM TILE
HOLLOW TILE
BRICK ON HOLLOW TILE
EARTH
ROCK
SAND
CONCRETE
CONCRETE WITH FOOTING
CINDER CONCRETE
COURSED AND UNCOURSED RUBBL
SLATE
CINDERS
MARBLE
CUT STONE
CUT STONE ON CONCRETE
CUT STONE ON CONCRETE BLOCK
GLASS, CELLULOID & TRANSPARENT MATERIAL
GLASS, SLATE MARBLE, PORCELAIN ETC.
ROUGH LUMBER
FINISH LUMBER
CONCRETE BLOCK
GLASS BLOCK
GLAZED BLOCK AND TILE
DOUBLE HUNG WINDOW IN FRAME WALL
DOOR IN FRAME WALL

Figure 60. Material Symbols

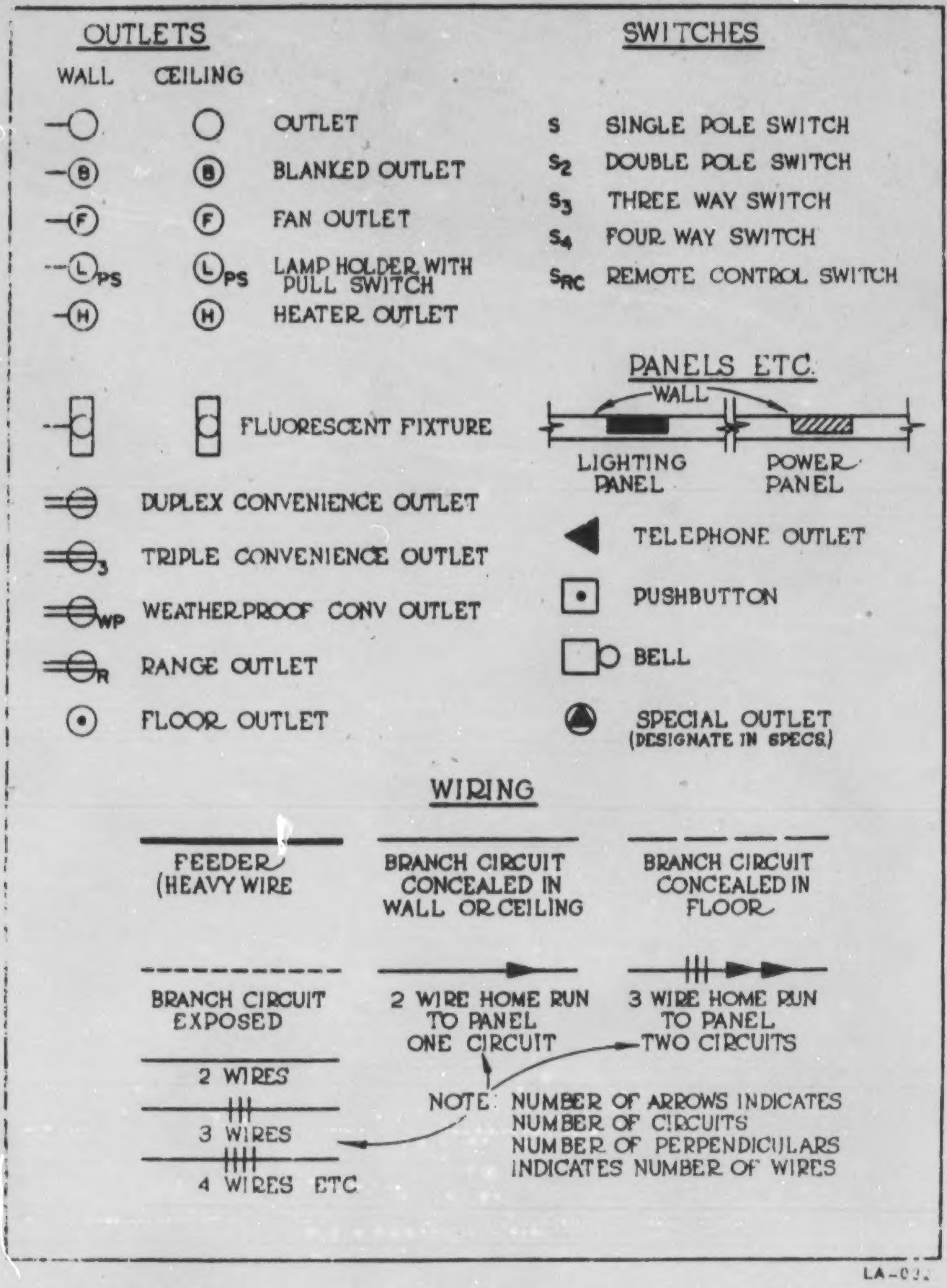

OUTLETS
WALL
CEILING
OUTLET
BLANKED OUTLET
FAN OUTLET
LAMP HOLDER WITH PULL SWITCH
HEATER OUTLET
FLUORESCENT FIXTURE
DUPLEX CONVENIENCE OUTLET
TRIPLE CONVENIENCE OUTLET
WEATHERPROOF CONV OUTLET
RANGE OUTLET
FLOOR OUTLET
SWITCHES
S SINGLE POLE SWITCH
S2 DOUBLE POLE SWITCH
S3 THREE WAY SWITCH
S4 FOUR WAY SWITCH
SRC REMOTE CONTROL SWITCH
PANELS ETC.
WALL
LIGHTING PANEL
POWER PANEL
TELEPHONE OUTLET
PUSHBUTTON
BELL
SPECIAL OUTLET (DESIGNATE IN SPECS.)
WIRING
FEEDER (HEAVY WIRE
BRANCH CIRCUIT CONCEALED IN WALL OR CEILING
BRANCH CIRCUIT CONCEALED IN FLOOR
BRANCH CIRCUIT EXPOSED
2 WIRE HOME RUN TO PANEL ONE CIRCUIT
3 WIRE HOME RUN TO PANEL TWO CIRCUITS
2 WIRES
3 WIRES
4 WIRES ETC
NOTE: NUMBER OF ARROWS INDICATES NUMBER OF CIRCUITS NUMBER OF PERPENDICULARS INDICATES NUMBER OF WIRES
LA-0

Figure 61. Electrical Symbols

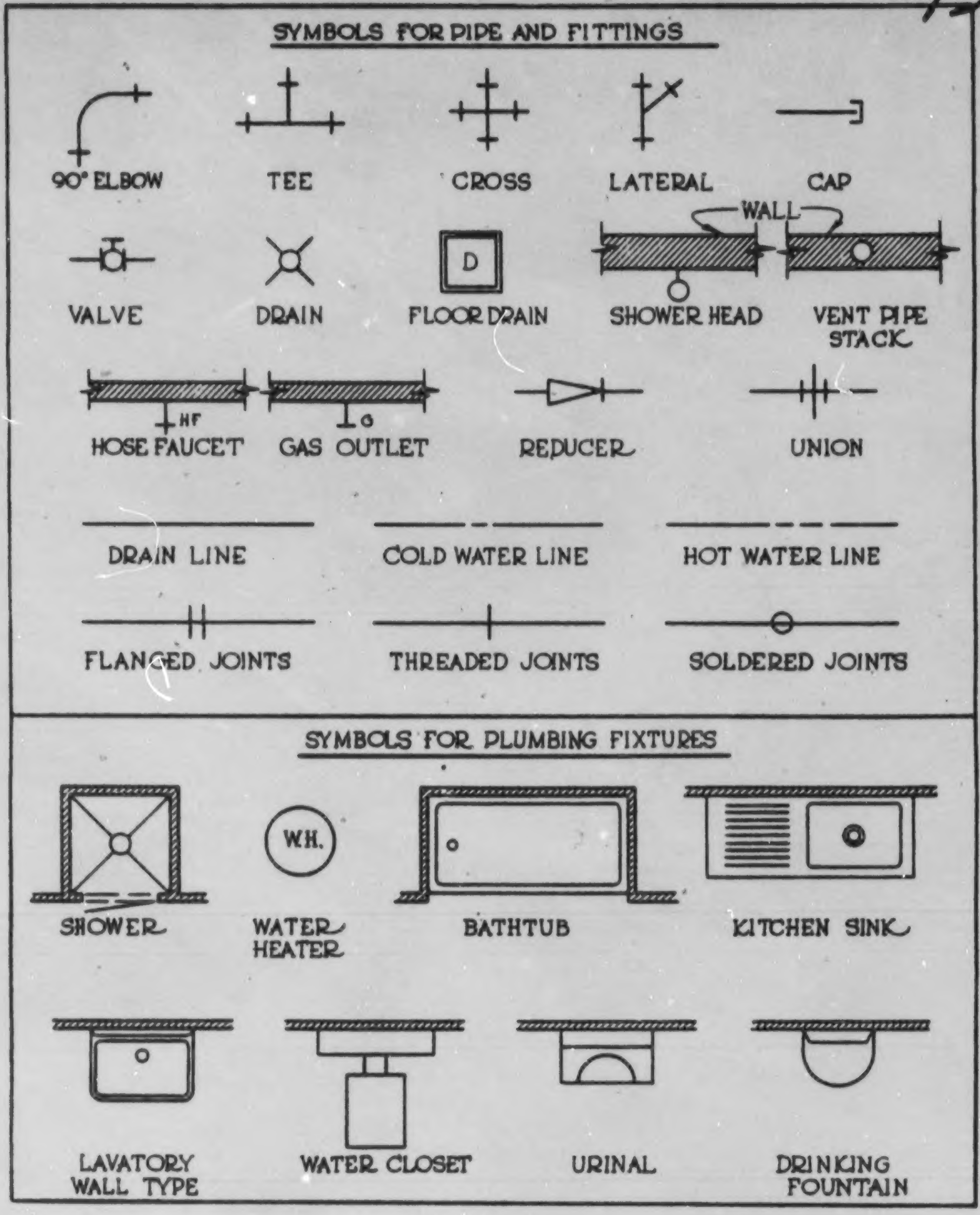

SYMBOLS FOR PIPE AND FITTINGS
90° ELBOW
TEE
CROSS
LATERAL
CAP
WALL
VALVE
DRAIN
D
FLOOR DRAIN
SHOWER HEAD
VENT PIPE STACK
HF
HOSE FAUCET
G
GAS OUTLET
REDUCER
UNION
DRAIN LINE
COLD WATER LINE
HOT WATER LINE
FLANGED JOINTS
THREADED JOINTS
SOLDERED JOINTS
SYMBOLS FOR PLUMBING FIXTURES
SHOWER
W.H.
WATER HEATER
BATHTUB
KITCHEN SINK
LAVATORY WALL TYPE
WATER CLOSET
URINAL
DRINKING FOUNTAIN

Figure 62. Plumbing Symbols

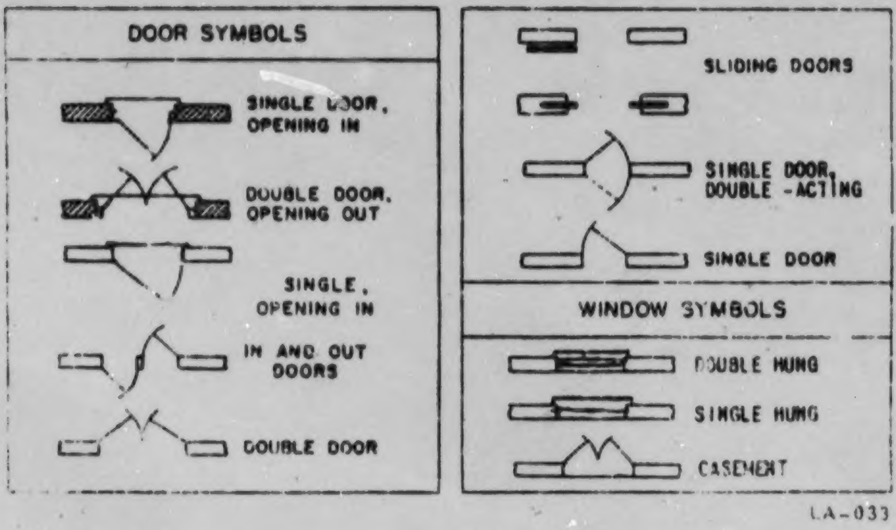

DOOR SYMBOLS
SINGLE DOOR, OPENING IN
DOUBLE DOOR, OPENING OUT
SINGLE, OPENING IN
IN AND OUT DOORS
DOUBLE DOOR
SLIDING DOORS
SINGLE DOOR, DOUBLE -ACTING
SINGLE DOOR
WINDOW SYMBOLS
DOUBLE HUNG
SINGLE HUNG
CASEMENT
LA-033

Figure 63. Door and Window Symbols

Common Abbreviations

Because of the lack of space on blueprints, it is common practice to use abbreviations for many items. Some of the more common abbreviated items are listed below:

Apt.	Apartment
Bm.	Beam
Bldg.	Building
B.R.	Bedroom
C.A.	Cold Air
Clg.	Ceiling
Clos., Cl., or C.	Closet
Cem.	Cement
Conc.	Concrete
Det.	Detail
Diam.	Diameter
D.R.	Dining Room
Dr.	Door
D.S.G.	Double-Strength Glass
D.H.	Double Hung
Dn.	Down
Drgs.	Drawings
Ea.	Each
El.	Elevation
Ent.	Entrance
Ext.	Exterior

Fin.	Finish
Flash.	Flashing
Fl.	Flooring or Flush
Fur.	Furring
Gar.	Garage
Galv.	Galvanized
G.I.	Galvanized Iron
Gl.	Glass
H.	Hall
Ht.	Height
H.A.	Hot Air
Jb.	Jamb
K. or Kt.	Kitchen
Lt.	Light
Linol.	Linoleum
L.R.	Living Room
Mldg.	Molding
Mull.	Mullion
Mor.	Mortar
O.C.	On Center
O.S.	Outside
O.S. Cas.	Outside Casing
R.	Riser or Radius
Rm.	Room
Sec.	Section
Specs.	Specifications
S.S.G	Single Strength Glass
Wd.	Wood
Yd.	Yard

BASIC DRAWING TOOLS

The instruments and equipment necessary to produce drawings are precision tools and must be given special care.

Drawing Board

A drawing board or table is used to provide a flat smooth surface for the paper while the drawing is being made and also provide a straightedge for guiding the T-square. A typical drawing board, with T-square and drawing paper in place is shown in figure 64.

Paper and Cloth

Drawing paper is available in a variety of grades, in either sheets or rolls, and in colors of white, cream or buff. For general pencil work, a

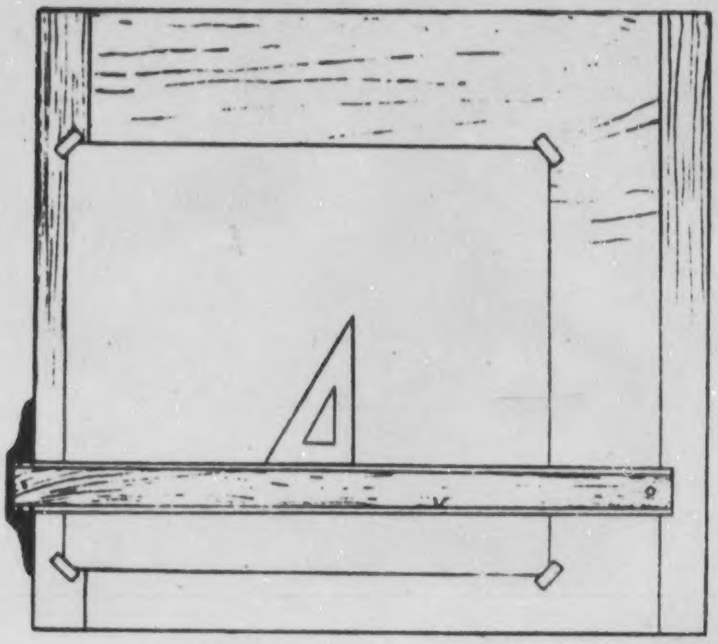


Figure 64. Drawing Board with T-Square

paper with slight grain and good erasing qualities is desirable. Thin, tough, translucent paper which is transparent with close contact is used to trace copies in pencil or ink. Tracing paper may also be used for original pencil drawings. Fine linen cloth treated so as to make it translucent and smooth is generally used for ink tracing. The dull side of the cloth is used and, prior to inking, the surface is slightly sprinkled and rubbed with powdered chalk or soapstone. Where an erasure has been made, the cloth is again treated with chalk or soapstone.

The paper should be placed with one edge near the left edge of the table or board, and with its top edge paralleled to the upper edge of the T-square blade when the head of the T-square is held firmly against the left edge of the board. The corners of the paper are then fastened by means of an adhesive (masking or cellulose tape), care being exercised to have the paper smooth. Thumbtacks are occasionally used, but are not as suitable as tape.

Pencils

Drawing pencils are graded by letters from 6B (softest) through 5B, 4B, 3B, 2B, B, HB (medium soft), F, H (medium hard), 2H, 3H, 4H, 5H, 6H, 7H, 8H, to 9H (extremely hard). Grades 4H and 6H are generally used for drawing lines while grades F, H, and 2H are preferred for lettering and sketching.

The pencil is sharpened with a knife or pencil sharpener so that approximately 1/4 to 3/8 inch of the lead is exposed. A conical point of desired fineness may be obtained by rubbing the lead back and forth on a sandpaper pad, rotating the pencil at the same time, as shown in figure 65, to avoid irregularly shaped sides on the point. The double bevel wedge point may be used for straight-line work. This type of point does not require sharpening as frequently as a conical point.

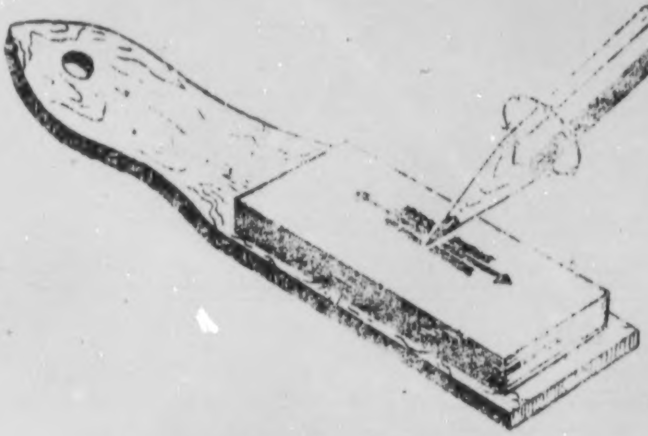


Figure 65. Sandpaper Pad

When drawing lines, the pencil is held almost vertically (slightly tilted away from draftsman) with only a slight incline in the direction of pencil movement. If the pencil has a conical point, frequent rotation will help preserve the sharpness of the point.

Erasers

A soft rubber eraser is required for erasing pencil lines, while a medium hard rubber eraser is best for erasing ink lines. A soft gum eraser is satisfactory for cleaning finished drawings.

When using an eraser, light, firm strokes should be made in one direction only, keeping the paper taut with the thumb and second (middle) finger. An erasing shield should be used whenever practicable to protect parts of the drawing which are not to be erased.

Drafting Compass

Drawings are a combination of straight and curved lines, the curved lines being circles or parts of circles are generally drawn with the compass. The compass consists of two legs hinged at the top to permit adjustment to the desired spread. One leg may be used interchangeably with a pencil leg, pen leg, and a lengthening or extension bar. The needlepoint of the compass is adjusted to extend approximately 1/65 inch beyond the pen or pencil point. The lead of the pencil leg should be beveled on the outside for approximately 3/16 inch, as shown in figure 67.

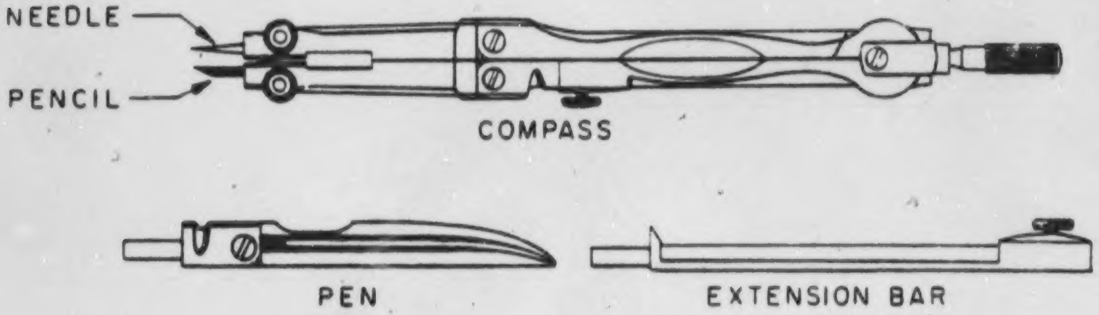


Figure 67. Drafting Compass and Its Parts

The compass is used with one hand. It may be opened with the second finger and thumb, and set to the desired radius by adjusting the spread with the second and third fingers. After the radius is set, the thumb and first finger are raised to the handle. The compass is started at the near side of the circle to be drawn and revolved clockwise, as shown in figure 68. It should be inclined slightly in the direction of rotation. To draw a circle with a radius of approximately 1 1/2 inches, the pencil leg may be straight. For a larger circle, and always when using the pen leg, the legs of the compass should be adjusted perpendicular to the paper.

Drafting Dividers

This instrument is similar to the compass except that both legs are equipped with points. It is used to transfer measurements on drawings, and for dividing a line into equal parts. Figure 69 shows the method of dividing a line into three equal parts by use of the dividers. The spread of the instrument is adjusted to approximately one-third of the line length. This spread of distance is stepped off as shown by alternately swinging the dividers to either side of the line. If three of these distances do not equal the length of the line, the setting of the dividers is increased or decreased by one-third of the error. This trial and error method is continued until exact division is obtained.

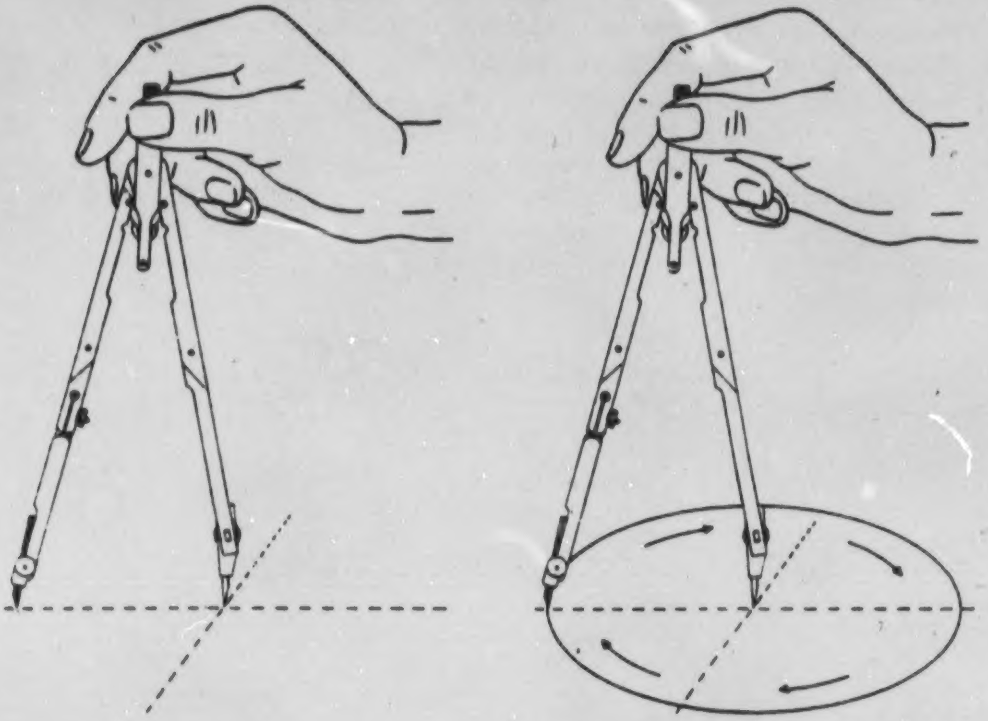


Figure 68. Use of Compass

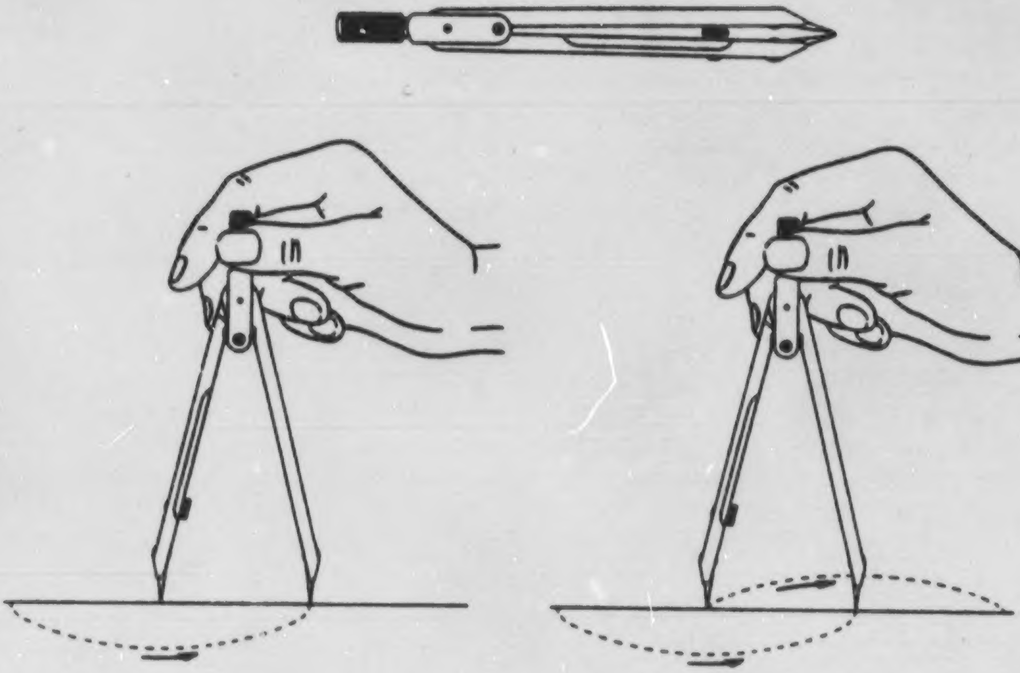


Figure 69. Dividers and Their Use

Scaling

Because full-scale drawings are usually impossible or impractical, they are reduced proportionally or scaled down. For example, one inch may be used to represent one foot. Using this scale, the actual drawing would be 1/12 the actual size.

In many cases, using a scale of 1 inch equals 1 foot is impractical because the drawing using this scale would still be too large for convenience. A scale where 1/2 inch is used to represent 1 foot is frequently used, and a drawing using 1/2 inch equal to 1 foot would be half as large as the same drawing using a scale where 1 inch equals 1 foot.

An architect's scale is a measuring device designed for use in making or interpreting drawings drawn to scale. The architect's scale is a triangular ruler, with various scales on the six edges. In addition to the usual 1-inch markings, scales of 1/8, 1/4, 3/16, 3/8, 1/2, and 3/4 inch are included. At the end of each scale, one section equivalent to one foot on that scale is divided into 12 equal parts. This scale may be used for scaling inches, and is included in addition to the foot or feet markings.

Examine an architect's scale, and you will note that some of the scales start with the zero foot markings on the left, while other zero foot markings are on the right. This is done to increase the range of the scale, and make reading the scale easier. The scales sharing markings are multiples; for example, the 3/16- and 3/8-inch scales share markings, and are on the same edge.

Note the 3/16 scale shown in figure 70. The 12 graduations which represent inches are shown at the left end of the scale, as viewed in the figure.

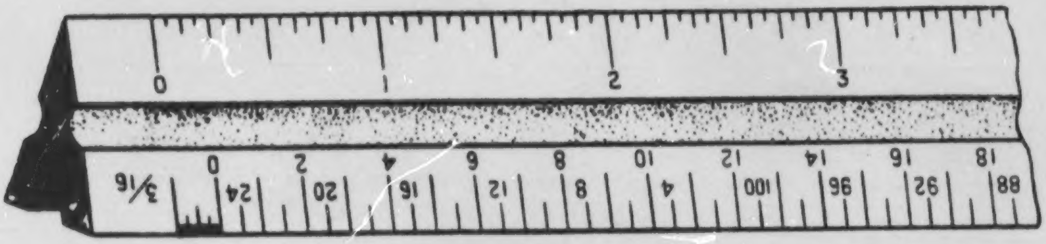


Figure 70. Architect's Scale

Using the architect's scale seems difficult at first, but given the opportunity to use the scale and practice, you will find its use relatively easy.

Care of Drawing Equipment

Proper care will lengthen the service of equipment and promote neat and accurate work. Each drawing instrument should be kept in its proper place in the instrument case when not in use. The drafting table should not be cluttered with idle instruments and tools. Care should be exercised to avoid damage to triangles and T-square edges. Celluloid equipment may be cleaned with soap and cold water. Care should be exercised when a compass or a pair of dividers is adjusted on the scale, as the needlepoints may damage the surface of the scale. The joints, either of a compass or a pair of dividers, should never be oiled.

CONSTRUCTION DRAWINGS

The construction drawings of a structure are presented in general and detail drawings. General drawings consist of plans and elevations; detail drawings are made up of sectional and detail views. Since it is the purpose of these drawings to be exact about shape and size, working drawings are generally scale-size projects. In some instances, a proportional-size detail drawing may be included to show how parts look when they are assembled.

In construction drawings, "plan" views are obtained, looking down on the object with a vertical line of sight. Plan views correspond to top views and involve only horizontal dimensions of width and depth. Any view involving vertical dimensions is an "elevation." This could be a front view, side view, or any other elevation view. Different elevations are indicated as front, right, etc., or according to the direction from which the view is taken. Writing on the drawing gives the type and size of materials used in construction. This writing is called construction notes and is usually found at the bottom of the print. The graphic scale is usually located in the lower right corner of prints.

Because of the size of the object being represented, different scales are used for general and detail drawings. In general, plan views and elevation views are drawn on separate sheets in order to make the view large enough for practical use. Detail views, drawn to a larger scale, furnish information not provided on general views. They are strategically placed on the main views and on additional sheets as needed to give the worker a complete picture of the structure.

Plot Plan

A plot or site plan shows the boundaries of the construction site and the location of the building in relation to the boundaries. It also shows the ground contour, roads and walks, and locates utility lines, such as sewer, water, gas, etc. These plans are drawn to scale from sketches and notes based on a survey of the area. By locating the corners of the building at specific distances from the established reference points, the plot plan gives the builder a definite starting point. A plot plan is shown in figure 71. The legend in the upper left corner of figure 71 shows the symbols for water, sewer, gas, and property lines. The arrow (25' - 0"), located at the bottom of the plan, indicates that the distance from the curb, next to the sidewalk, to the centerline of Kirk St. is 25'-0". The title block in the lower right corner of the print tells you what is to be constructed and gives the meaning of different symbols used throughout the plan. The names of the persons responsible for drawing, tracing, checking, and submitting the plan are also in the title block, along with the signature of the engineer responsible for the job and the date. The scale for this plot plan is 5/32" = 1' - 0".

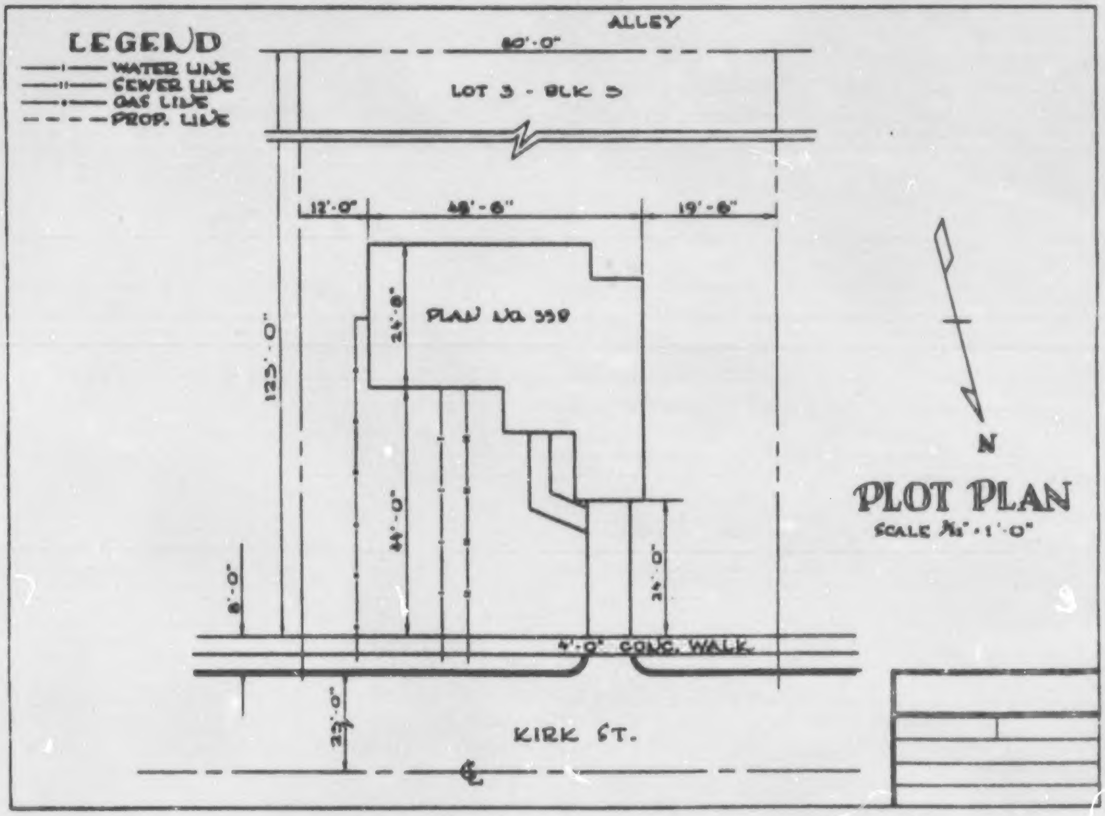

LEGEND
WATER LINE
SEWER LINE
GAS LINE
PROP. LINE
ALLEY
80'-0"
LOT 3 - BLK 5
12'-0"
48'-6"
19'-6"
125'-0"
PLAN NO. 358
24'-8"
44'-0"
8'-0"
24'-0"
4'-0" CONC. WALK
25'-0"
KIRK ST.
℄
N
PLOT PLAN
SCALE 5/32" = 1'-0"

Figure 71. Plot Plan

Foundation Plan

The foundation is the starting point in the actual construction, and a completely dimensioned plan is furnished. When a "post and wall" type foundation is used, the foundation plan may be combined with a floor framing plan. Figure 72 shows a concrete slab foundation which has warm air ducts imbedded in the slab. Detail B of figure 72 illustrates a cross-sectional view of the duct, extending from the heating unit, under the concrete floor. The broken lines indicate the ducts and the cross (+) shows the duct opening. Attached to the foundation plan, there will be a detail sheet, which consists of the necessary details or specifications needed to complete any given job.

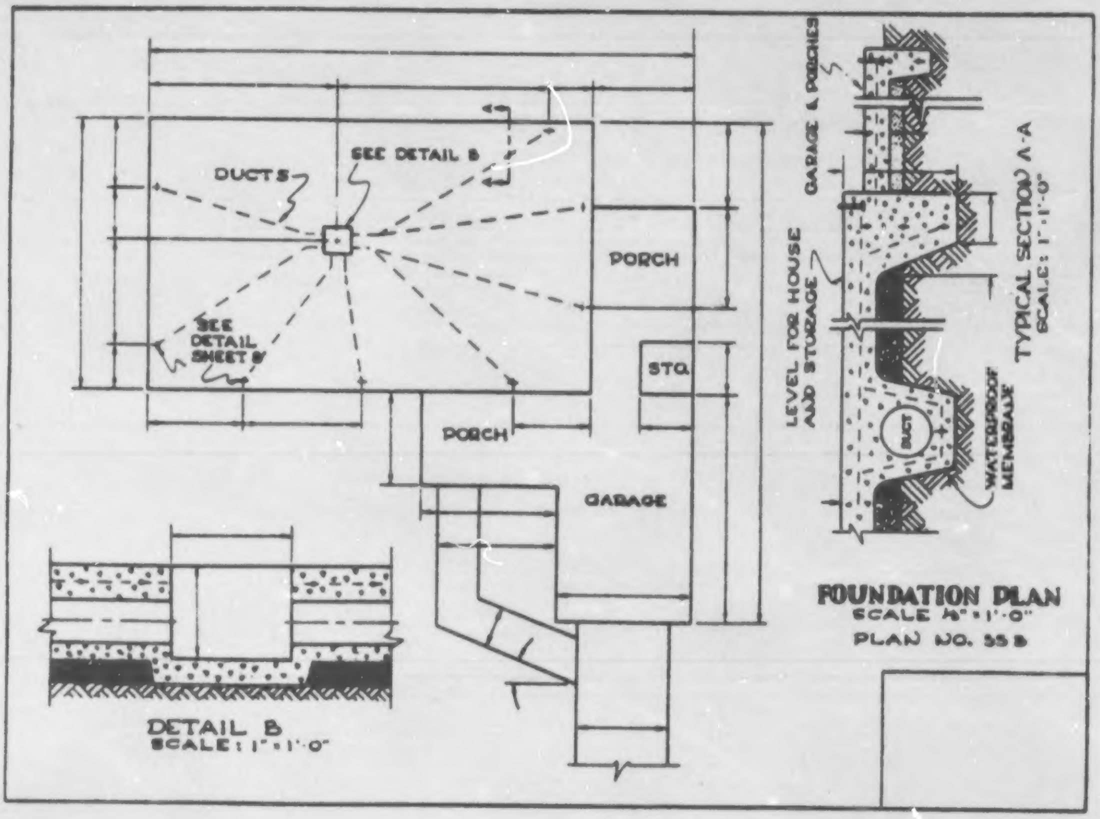

DUCTS
SEE DETAIL B
SEE DETAIL SHEET 8
PORCH
STG.
PORCH
GARAGE
DETAIL B
SCALE: 1" = 1'-0"
GARAGE & PORCHES
LEVEL FOR HOUSE AND STORAGE
DUCT
WATERPROOF MEMBRANE
TYPICAL SECTION A-A
SCALE: 1" = 1'-0"
FOUNDATION PLAN
SCALE 1/8" = 1'-0"
PLAN NO. 55 B

Figure 72. Foundation Plan

Framing Plans

Framing plans show the size, number, and location of structural members which form the building framework. Separate plans may be furnished for floors, walls, and roofs. The floor-framing plan, shown in figure 73, specifies the size and spacing of joists, girders, and columns used to support the floor. Detailed views are usually added to show the method of anchoring joists and girders to the foundation, as shown in the detail view on the right side of figure 73. Wall-framing plans show the size and location of wall openings, ceiling heights, and other details. Roof-framing plans show the construction of the rafters or trusses which span the building and support the roof.

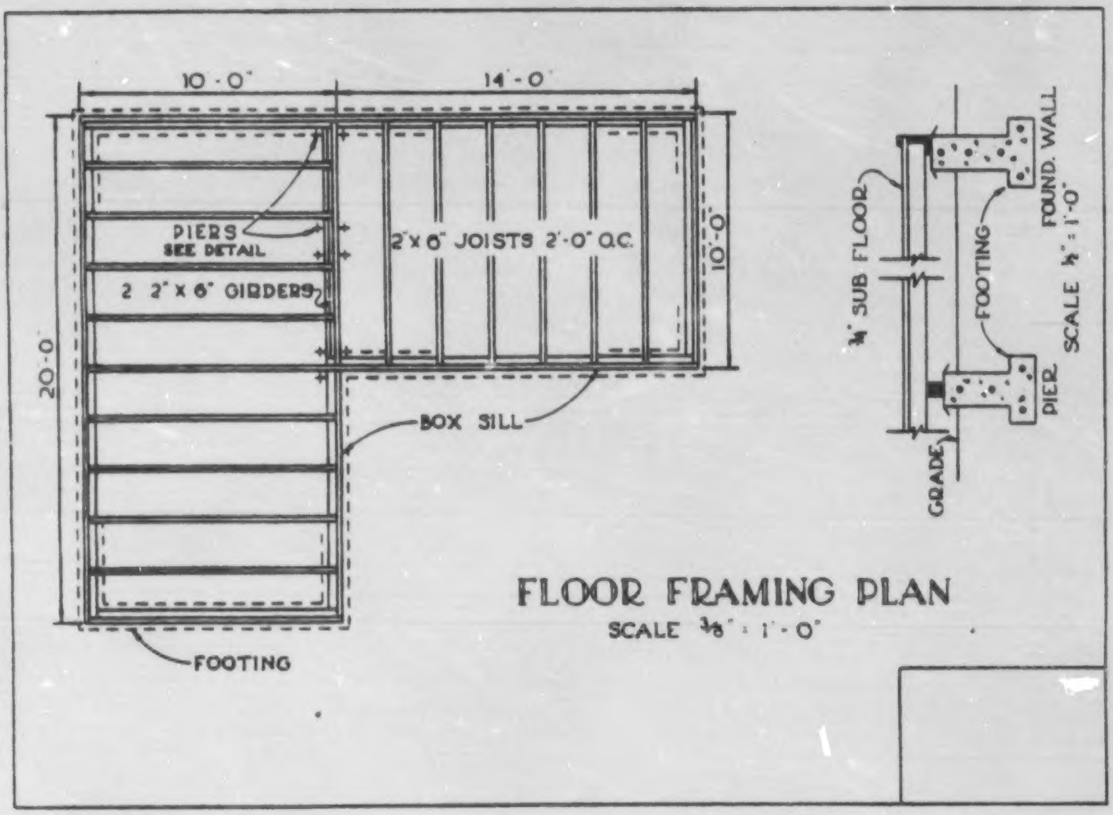

10 - 0"
14' - 0"
20' - 0"
10' - 0"
PIERS
SEE DETAIL
2" x 6" JOISTS 2' - 0" O.C.
2 2" x 6" GIRDERS
BOX SILL
FOOTING
3/4" SUB FLOOR
GRADE
FOOTING
FOUND. WALL
PIER
SCALE 1/2" = 1'-0"
FLOOR FRAMING PLAN
SCALE 1/8" = 1' - 0"

Figure 73. Framing Plan

Floor Plan

A floor plan, shown in figure 74, is a cross-sectional view of the building. This view is obtained by assuming that a building is cut in half horizontally, exposing every room in the building. If the building has more than one floor, a plan for each floor is drawn. The floor plan shows the outside shape of the building: the arrangement and size of rooms; the type of material; and the type, size, and locations of doors and windows. In addition, it shows the heating, lighting and plumbing fixtures.

Floor plans are usually drawn to small scales such as 1/4" = 1' - 0", or 3/16" = 1' - 0". This scale is shown at the bottom of figure 74. For this reason, conventional symbols are used to indicate fixtures and materials. For complex structures, it may be necessary to supply separate

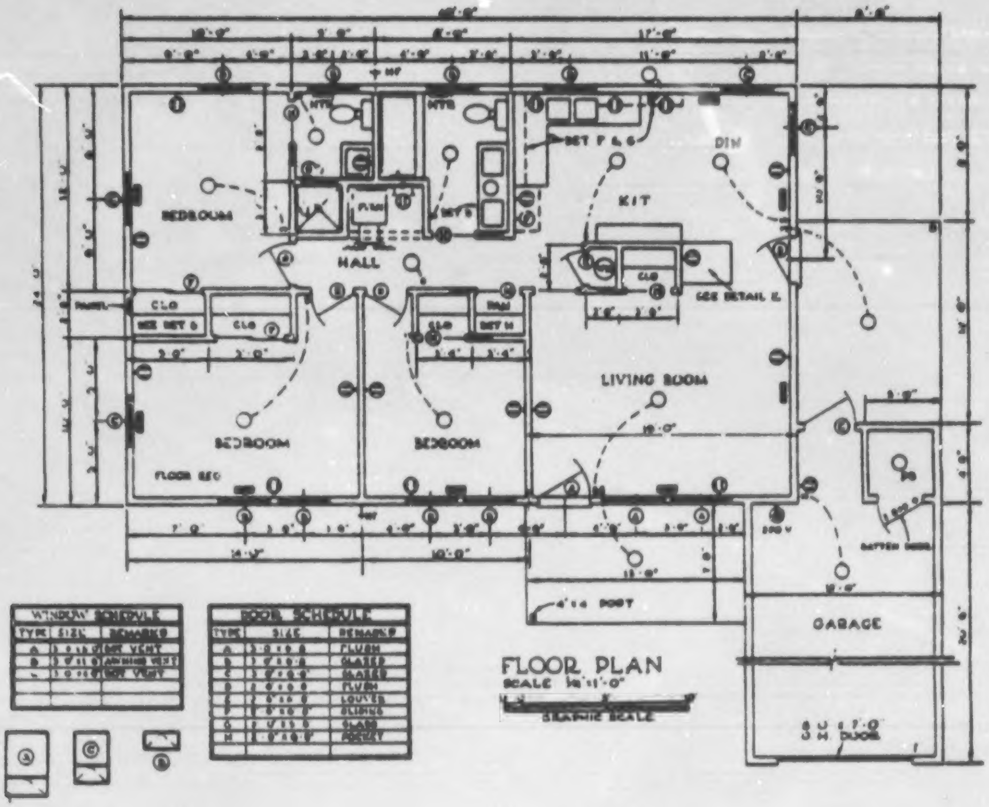

BEDROOM
HALL
KIT
DIN
CLO
LIVING ROOM
BEDROOM
BEDROOM
GARAGE
WINDOW SCHEDULE
DOOR SCHEDULE
FLOOR PLAN
SCALE
GRAPHIC SCALE
FLUSH
GLAZED
LOUVER
SLIDING

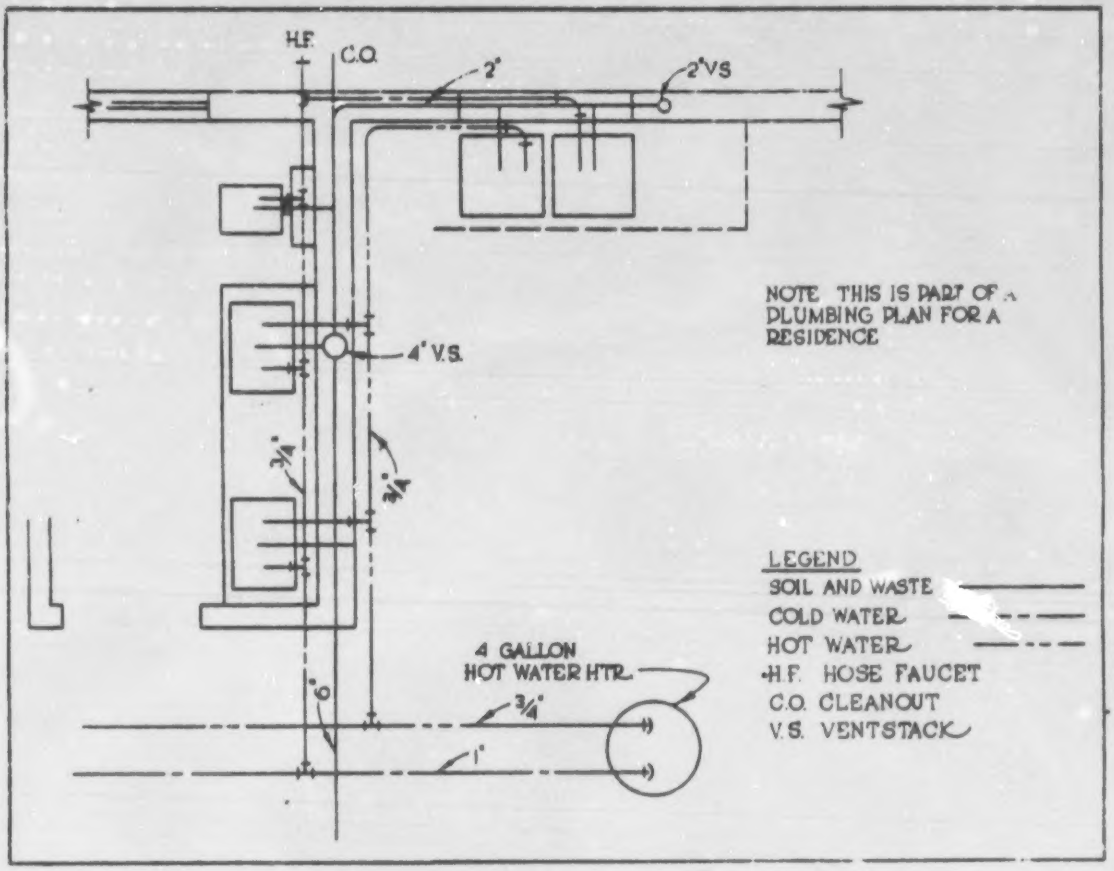
Figure 74. Floor Plan

utilities plant to show electrical, heating, and plumbing layouts. A plumbing plan is shown in figure 75. Some of the plumbing symbols are illustrated under the legend. A symbol for a 40-gallon hot water heater is also shown.

A floor plan sheet may also contain details of construction, although these are generally presented on a separate sheet. When a detail drawing is furnished to show a particular construction, a reference is noted on the floor plan. Also shown on the floor plan are "schedules" for doors and windows. A schedule is a method of presenting notes and other construction data in the form of a table, as shown in the left lower corner of figure 74.

A door schedule specifies the type, size, description, and location of each door, and a window schedule gives the same information for a window. By looking at the letter B, for example, above the window symbol in figure 74, and then locating the same letter in the window schedule, you come up with the correct size and type of window - in this case, 3' - 0" x

1' - 6" awning vent. The correct sizes and types of doors are located in the same manner. Through the use of standard plumbing and electrical symbols, it is easy to locate plumbing fixtures, hot and cold water lines, electrical wall and ceiling outlets, switches, types of wire, etc. These symbols are illustrated and explained later in this section.


H.F.
C.O.
2"
2" VS
4" V.S.
3/4"
3/4"
6"
4 GALLON HOT WATER HTR.
3/4"
1"
LEGEND
SOIL AND WASTE
COLD WATER
HOT WATER
H.F. HOSE FAUCET
C.O. CLEANOUT
V.S. VENTSTACK

NOTE THIS IS PART OF A PLUMBING PLAN FOR A RESIDENCE

Figure 75. Plumbing Plan

Each person having anything to do with the construction of a building, runway, etc., will have drawings, plans, specifications, and notes pertaining to his particular part of construction. Since all information cannot be presented graphically, construction notes are extensively used. These notes are a vital part of every construction drawing, and they must be carefully worded. There are general notes pertaining to the entire set of plans, and local notes that are important only to certain sheets or certain parts of the drawing.

Since plan and elevation views cannot be drawn as related views on one sheet (except for small structures), scaled measurements must be used for each view. However, a completed plan view may be taped in the proper position on the drawing, and the main dimensions and door and window locations may be projected to an elevation sheet.

Elevation views are made more lifelike by accenting certain lines and adding straight lines to represent the type of material used on the exterior. These representations are shown in figure 76. Lines which may be accented are window, roof, door, and building outline lines. To accent lines, one must assume that light is coming from a certain direction and that accented lines represent shaded areas. The use of straight lines to suggest the texture of exterior materials is a form of architectural "rendering." Rendering, as applied to architectural drawing, is the use of pencil, ink, watercolor, or a combination of these to depict a structure and bring out its form or shape.

Sections and Details

A section and a detail are practically synonymous; however, no view is called a detail unless it is drawn to an enlarged scale to show construction features more clearly. A south wall detail of a living room, a framing detail of a gable, and a shelf detail are shown in figure 77. The detail sections show parts of the structure with greater exactness than the small-scale section taken through the structure. When the cutting plane cuts across the narrow part of a structure or building, the view is called a transverse section. Sectional views taken lengthwise are called longitudinal sections. Detail sections which are usually shown are foundation, wall, door, window, or any other section considered necessary to explain the construction.

Exterior detail views, like detail sections, are large-scale drawings designed to show features which are too small or too complex to be shown in other views. They are usually developed in right-angle projection, but a pictorial projection may be used if it shows the construction to a better advantage. Important parts of detail and sectional views are the notes and dimensions to show the size of materials and the placement of parts in relation to each other. For instance, section A of figure 78 gives such details as rafter sizes (2 x 6 rafters 16" on center), sloped ceiling in the living room and kitchen, gravel roof, etc. The specifications describing the length of the rafters, amount of slope, and the thickness of the gravel roof would be included in the construction notes for the job.

PLAN VIEWS. It is sometimes difficult to tell the exact shape of a building from the elevation views alone. For this reason, we have a plan view which shows what the structure looks like from a point directly above.

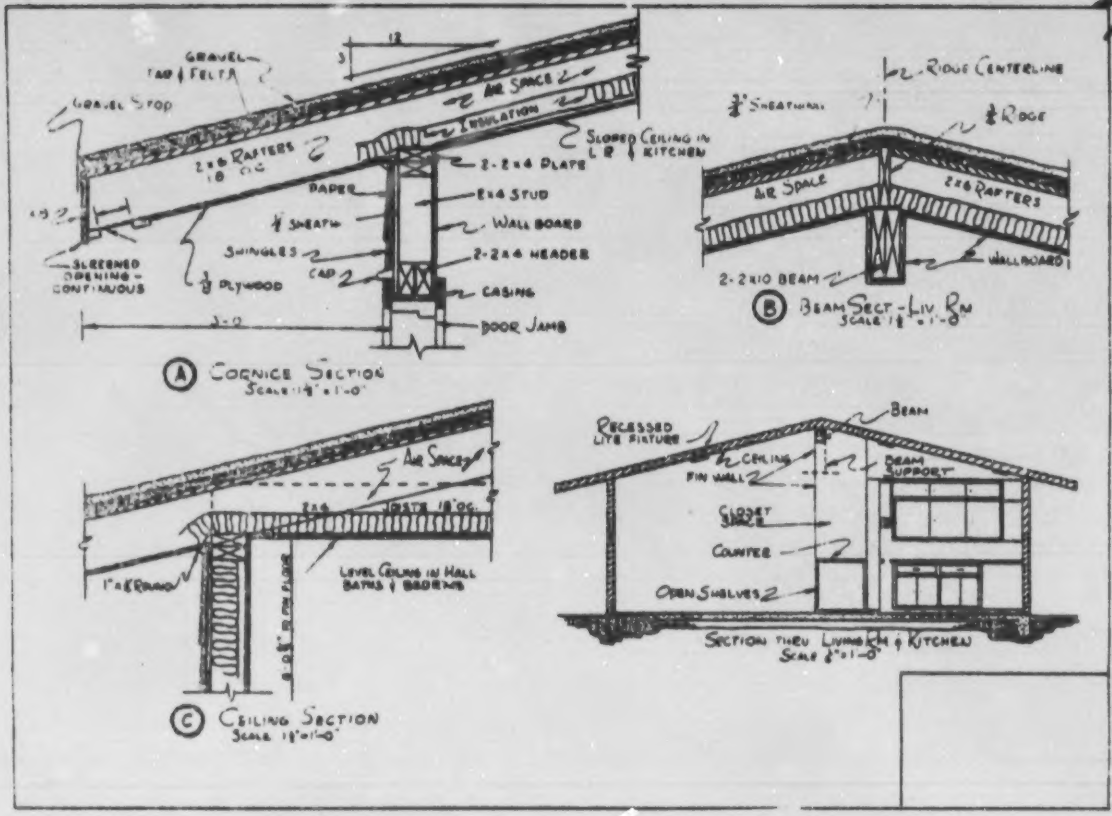

GRAVEL
TAR & FELT
GRAVEL STOP
12
3
AIR SPACE
INSULATION
2×6 RAFTERS
16" O.C.
SLOPED CEILING IN
L R & KITCHEN
2-2×4 PLATE
PAPER
2×4 STUD
¼" SHEATH
WALL BOARD
SHINGLES
2-2×4 HEADER
CAP
CASING
SCREENED
OPENING -
CONTINUOUS
½" PLYWOOD
DOOR JAMB
2-0
Ⓐ CORNICE SECTION
SCALE 1½" = 1'-0"
RIDGE CENTERLINE
¾" SHEATHING
⅝" RIDGE
AIR SPACE
2×6 RAFTERS
WALLBOARD
2-2×10 BEAM
Ⓑ BEAM SECT - LIV RM
SCALE 1½" = 1'-0"
AIR SPACE
2×4
JOISTS 16" O.C.
1"×6" RAKE
LEVEL CEILING IN HALL
BATHS & BDRMS
8'-0⅛" FLOOR
Ⓒ CEILING SECTION
SCALE 1½" = 1'-0"
RECESSED
LITE FIXTURE
BEAM
CEILING
FIN WALL
BEAM
SUPPORT
CLOSET
SPACE
COUNTER
OPEN SHELVES
SECTION THRU LIVING RM & KITCHEN
SCALE ⅛" = 1'-0"

Figure 78. Sections

This was illustrated in the floor plan and the floor-framing plan. Plan views are very simple and easy to understand, even though they contain a great amount of information.

DETAIL VIEWS. Elevation and plan views together show the major construction of the building.

Specifications

In the preceding paragraphs, you learned the types of working drawings and how to read them. These drawings and prints would be worthless without the written notes and specifications explaining the types of materials and different aspects of the job.

The written notes and explanations about materials or other items that appear on a drawing are called specifications. It is necessary to have these written notes in order to give complete information. For example, a symbol on a drawing may show that a building is to have wood siding. The carpenter must know how much of the siding is to be exposed to the weather. This information is given as a note on the drawing.

In addition to the notes on the drawing, a written set of specifications is included as a part of every complete set of plans or prints. These specifications are as important as the drawings. They describe all materials and give detailed instructions concerning the building. The specifications must be studied as carefully as the drawings in order to fully understand the plans.

The specifications are usually made in separate divisions for each of the building trades, such as plumbing, painting, or carpentry. The division pertaining to carpentry will indicate who will furnish and complete all carpentry work shown on the drawings or given in the specifications. This division will contain a list of work included as follows:

- All woodwork, trim jambs, doors, paneling, plywood, and interior millwork.
- All wood framing, including framing for all trades.
- All wood furring, nail strips, sleepers, blocking, grounds, wood bucks, wood studs, etc.
- Rough hardware (nails, spikes, bolts, etc.)
- Finish hardware.
- Cutting and fitting all woodwork in this division for work of all trades.
- All other carpentry work necessary to accomplish the particular job.

Each division of the specifications will contain specific information about the materials to be used on the job. The material section of the carpentry division gives all information related to materials and methods of installation as listed below:

- The exact grade, type, and size of wood to be used for various parts of the building.
- The spacing of various members, such as studs, rafters, joists, etc.

- The placing of studs, trimmers, or headers around all openings.
- The type of wood to be used for interior finish when this information is not indicated on the drawings.
- The erection of all members plumb, level, square, and true in accord with details.
- The use of fastening devices, such as nails, bolts, screws toggles, etc.
- All other information necessary to assure that the materials used are of a certain standard and the quality of workmanship is acceptable.

In addition to the other information included in the specifications, a complete description of the building site should be included. A drawing showing how the building is to be placed on the specified plot of ground should be included in the plans.

SUMMARY

The construction drawings, plus the specifications are the chief sources of information for the supervisors and craftsmen responsible for the actual work of construction.

As a carpenter using construction drawings, you will need to interpret drawings, symbols, and terminology.

Drawing tools and an architect's rule are necessary when drawing plans for a structure. The architect's rule is used to draw accurate scale drawings.

A plan view of a view of an object or area as it would appear if looking straight down onto it. The most common plan views are plot plans, foundation plans, framing plans, and floor plans.

Elevations show the exterior, front, rear, and sides of a structure. Exterior materials; height of door, windows, and rooms; and the surrounding ground level can be shown in elevation views.

A section view is a view of a cross section of any part of a structure.

Detail drawings are drawings which are done on a larger scale than that of the general drawings, and which show features not appearing at all, or appearing at all, or appearing on to small a scale on the general drawings.

Specifications are written, telling in words what cannot be told graphically on the construction drawings. The information furnished by the specifications includes directions for concrete mixtures: grades of lumber, bricks, and other materials; quality of mechanical appliances and hardware; detailed instructions as to how the work is to be performed.

QUESTIONS

1. What are the two general classes of drawings?
2. How can you determine the width and dpeth of a lot and the building to be placed on it from the drawings?
3. Where will you obtain information not given in the general views of a new building?
4. Where can you find the height of the ceilings in a building to be constructed?
5. In what plan would you find heating, plumbing, and lighting fixtures?
6. When is it necessary to have an elevation for each side of a building?
7. What is the most important value of a sectional view?
8. What are working lines and what do they indicate?
9. What do breaklines indicate?
10. How would 6 feet and 1/4 inch be shown on a drawing specifying dimensions?

REFERENCE

Fundamentals of Carpentry, Volume I, American Technical Society, copyright 1966.

INTERPRETING DRAWINGS

OBJECTIVE

Upon completion of this unit of instruction, you will be able to determine from construction drawings, the information and specifications necessary in the construction of a typical frame structure.

EQUIPMENT

	Basis of Issue
WB 3ABR55230-I-9-P1	1/student
Architect's Scale	1/student
Textbook "Modern Carpentry"	1/student

Mission 1

After you complete this unit of instruction, you will be able to match a written description of construction drawings with the name of each type of drawing.

1. Plot Plan
2. Foundation Plan
3. Framing Plan
4. Floor Plan
5. Elevation

_____ Picture-like view taken from the front, rear, right, or left side.

_____ Shows actual starting point in construction.

_____ Shows the size, number, and location of structural members.

_____ Cross sectional view of the building looking down from above.

_____ Shows the boundaries of the construction site.

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Mission 2

Given a series of scaled lines, use an architect's scale to measure their length.

Scale Length

Scale: 1/4" = 1' 0" ______

Scale: 1/8" = 1'-0" ______

Scale: 1/2" = 1'-0" ______

Scale: 3/8" = 1'0" ______

Scale: 3/4" = 1'-0" ______

Scale: 1 1/2" = 1'-0" ______

Mission 3

Match the name of drawing symbols with a picture of the symbol.

1. Match the following names of material symbols with the pictures in figure 79. Write the letter on the line below the corresponding symbol.

a. Loose fill insulation.
b. Stucco
c. Finish lumber
d. Concrete block
e. Gypsum tile
f. Sand
g. Concrete
h. Glass and transparent material
i Earth
j. Frame
k. Plaster with metal lath
l. Batt insulation
m. Brick
n. Concrete with footing
o. Rough lumber
p. Double-hung window
q. Coarse and uncoarse rubble
r. Rock
s. Brick veneer
t. Face brick on common brick
u. Plaster
v. Exterior door

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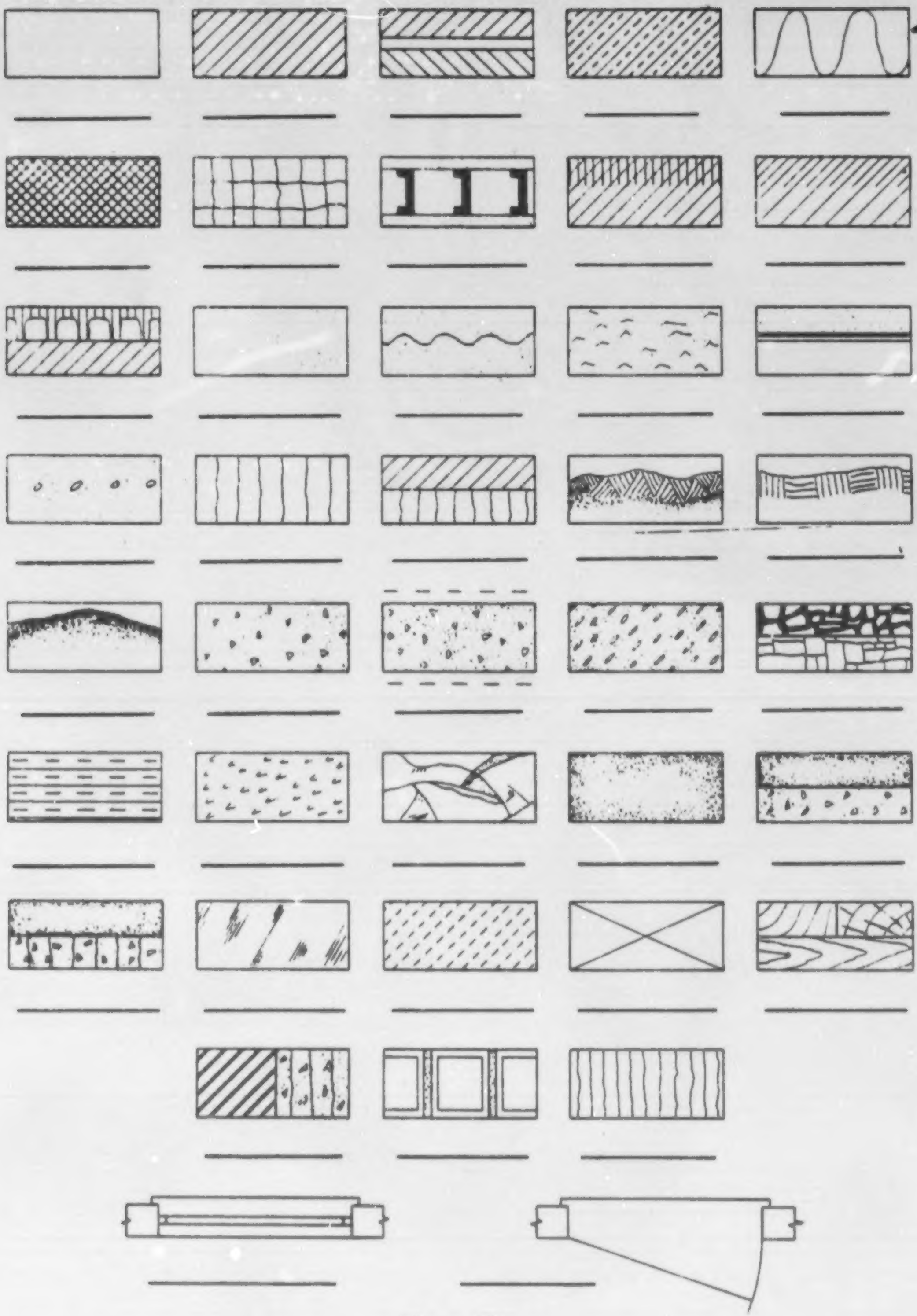

Figure 79

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Mission 4

Given a set of architectural drawings, extract the following information from the drawings.

1. Building location on the plot plan and information on the building foundation construction.

2. Sizes and spacing of structural framing members.

3. Types and sizes of window and door units.

4. Location of wall partitions and closets.

5. Sizes and installation of cabinets.

Using the drawings on pages 72 through 79 in textbook, Modern Carpentry, answer the following questions.

1. Assume that the size of the building lot is 60' x 40', and that the building is centered on the lot. How much space is left between the building lines and the boundaries of the lot? Front __________ Rear __________ Left Side __________________ Right Side ______________.

2. What is the width of the foundation wall under the frame walls? ____________________________ Under the brick veneer for plant box? ____________________________.

3. What is the width of the footing for the foundation wall under the frame walls? ____________________.

4. What size lumber is used for the rafters and what is the rafter spacing? ____

5. What distance does the eave of the roof project out from the building? ____

6. What is the height of the ceiling from the subfloor? ____________________

7. What is the size, type, and design of the front entrance door? ____

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8. Give a complete description of the large window in the front of the house to the left of the chimney. ______________________________

____

____

9. What type door is used between the kitchen and the dining room? __________

____

10. What is the location of the partition wall between the two front bedrooms?

____

11. What is the location of the partition wall separating the closets of the two side bedrooms? ______________________________

____

12. What is the height of all kitchen countertops? __________

13. How much space (width and height) is allowed for the refrigerator?

____

Mission 5

Using a set of building specifications, extract the following information.

1. General Requirements
2. Standards of Workmanship
3. Quality of Materials
4. Provisions for Changes

A portion of the specifications for a squadron administrative building are included as a part of this workbook. Research these specifications and answer the following questions.

1. In what manner and by whom will the work be done on this project?

____

____

____

____

2. What are the principal features of this project?

3. What type of rafters may be used as an option to standard rafters?

4. What difference may there be in the plywood used for wall sheathing and that used for roof sheathing?

5. What is the maximum moisture content of lumber used for roof planking?

Mission 6

Make a working sketch of a carpentry project to be constructed in days 8, 9 and 10. Specifications and dimensions will be provided by the instructor.

Your instructor will provide you with several choices of projects. Be sure you select something you feel sure you can accomplish. He will also provide you with paper to use for your sketch. Your sketch does not have to be drawn to scale but in order to be useful to you it should be fully dimensioned.

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SPECIFICATIONS

FOR

SQUADRON ADMINISTRATIVE BUILDING

Project Number 312 - 12 - 9937

IFB Number 505 - B50C - 2568

SHEPPARD AIR FORCE BASE

WICHITA FALLS, TEXAS

149

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STATEMENT OF WORK

SW-1 DESCRIPTION OF WORK:

a. Work to be done: The work to be performed under this contract and in accordance with these specifications will consist of furnishing all necessary plant, labor and materials and constructing, installing and performing all work shown on the drawings, or specified in the Principal Features of these specifications, in strict accordance with the drawings, schedules and specifications, all of which are made a part thereof.

b. Character of Work and Mechanics: The work shall be executed in the best and most workmanlike manner by qualified, , careful and efficient mechanics in strict accordance with the drawings and specifications.

c. Location: Sheppard AFB is located in Wichita County approximately five miles north of Wichita Falls, Texas.

SW-2 PRINCIPAL FEATURES:

a. Construction of a squadron administrative building.

b. Installation of water distribution system and all services.

c. Installation of sanitary sewer system and all services.

d. Installation of electrical distribution system.

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SECTION III

ROUGH CARPENTRY

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SECTION III

ROUGH CARPENTRY

1. MATERIALS shall conform to the respective specifications and other requirements specified below:

1.1 Accessories and nails:

1.1.1 Anchor bolts: Steel, size as indicated, complete with nuts and washers.

1.1.2 Metal bridging: Optional to wood bridging; zinc-coated steel, size and design to provide rigidity equivalent to the specified wood bridging, designed for installation by nailing in place.

1.1.3 Nails and staples: Size and type best suited for the purpose, in accordance with Federal Specification FF-N-105 when applicable to the type to be used. For sheathing and subflooring, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1-inch thick lumber and for toe nailing 2-inch thick lumber; 16-penny or larger nails shall be used for nailing through 2-inch thick lumber.

2. FRAMING AND MISCELLANEOUS WOOD MEMBERS:

2.1 Stress-graded members: Any species and grades listed in the National Forest Products Association publication, National Design Specification for Stress-Grade Lumber and Its Fastenings, or machine stress rated lumber in accordance with the rules under which the species is graded, providing the required design stresses. Unless otherwise shown, stress-graded lumber used in the fabrication of trusses and other fabricated structural members and for joists, rafters and headers shall have design stresses not less than $1200F_b$ or $900F_c$ and 1,540,000E. Design of members and fastenings shall conform to American Institute of Timber Construction publication, Timber Construction Manual.

2.1.1 Trussed rafters: As an option to standard rafters, trussed rafters may be provided. The design shall be as indicated. Connections shall be made with light-metal-plate connectors or plywood gussets. Fabrication and testing of light-metal-plate-connected trusses shall be in accordance with publication TPI-66 of the Truss Plate Institute; and fabrication and testing of plywood gusset connected trusses shall be in accordance with the publication, Plywood Truss Designs of the American Plywood Association.

2.1.2 Non-stress-graded members: Sizes shall be as follows, unless otherwise shown:

Member	Size (inches)
Blocking	2 X 4 of such larger size as required when applied between framing members, smaller sizes when approved for a specific use.

Member	Size (inches)
Bridging	1 X 3 for use between members 2 X 12 and smaller; 2 X 3 for use between members larger than 2 X 12.
Corner bracing	1 X 4
Furring	1 X 3
Sleepers	2 X 4
Studs	2 X 4

2.2 Insulation:

2.2.1 Batt or blanket: Mineral wood, Federal Specification HH-I-521, Type I. Class (A) (B) (C); or cellulose, vegetable, or wood fiber, Federal Specification HH-I-515 (Type I), (Type II, Class A, Style (1) (2). Edges of facings shall be suitable for fastening to supporting members.

2.3 Moisture barrier: Building paper, Federal Specification UU-B-790, Type I. Grade D, Style Ia; or asphalt saturated felt, ASTM Standard D 226, 15 pound.

2.4 Sheathing: Either fiberboard, gypsumboard, plywood or wood for wall sheathing; and either plywood or wood for roof sheathing.

2.4.1 Gypsumboard: Federal Specification SS-L-30, Type II, Grade W, Class 2, Form a; 1/2 inch thick; 4 feet wide with Style 1 edge for supports 16 inches on center without corner bracing of framing or for supports 24 inches on center with corner bracing of framing; 2 feet wide with Style 2 edge for supports 16 or 24 inches on center with corner bracing of framing.

2.4.2 Plywood: Product Standard PSI, standard grade for wall sheathing. standard grade with exterior glue for roof sheathing. Wall sheathing shall be 4 feet wide, 3/8 inch thick for supports 16 inches on center without corner bracing of framing, and 1/2 inch thick for supports 24 inches on center without corner bracing of framing. Roof sheathing shall be 3/8 inch minimum thickness with an identification index of 16/0 or greater for supports 16 inches on center and 3/8 inch minimum thickness with an identification index of 24/0 or greater for supports 24 inches on center.

2.4.3 Wood: Species and grade shall be in accordance with Species and Grade Table at the end of this section; center-matched, shiplapped, or square edge, except exposed roof sheathing shall be V-jointed, matched, and dressed. Wall sheathing shall be 1 inch thick for supports 16 or 24 inches on center without corner bracing of framing provided sheathing is applied diagonally. Roof sheathing shall be 1 inch thick for supports 16 or 24 inches on center.

2.5 Subflooring: Either plywood or wood.

3 GRADING AND MARKING: Hardboard, particleboard, lumber, insulation, plywood, fiberboard sheathing, gypsum board sheathing, and structural glued laminated

members shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which they are produced. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Except for plywood, lumber, and structural glued laminated members, bundle marking or certificates will be permitted in lieu of marking each individual piece.

4. SIZES: Lumber sizes shall conform to US Department of Commerce Simplified Practice Recommendation 16, and unless otherwise specified shall be surfaced on four sides. Sizes for materials other than lumber shall conform to the requirements of the rules or standards under which they are produced. Size references, unless otherwise specified, are the nominal sizes, and the actual sizes shall be within the manufacturing tolerances allowed by the standard under which the product is produced.

5. MOISTURE CONTENT at the time of delivery and when installed in the work shall be as follows:

Treated and untreated lumber 2 inches or less in thickness, except roof planking: 19 percent maximum.

Treated and untreated lumber over 2 inches in thickness, except roof planking: 25 percent maximum.

Roof planking 2 inches or more in thickness: 15 percent maximum.

Materials other than lumber: In accordance with the standard under which the product is produced.

6. DELIVERY AND STORAGE: Materials shall be delivered to the site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

7. PRESERVATIVE TREATMENT: To the extent indicated below, members and plywood specified in this section shall be preservative treated by pressure methods and so marked in accordance with the American Wood Preservers Institute Standards. Except as otherwise specified, treatment shall be in accordance with AWPI Standard LP-2, AWPI Standard LP-3, or AWPI Standard LP-4, at the option of the contractor. Treatment of wood to be in contact with soil or water shall be in accordance with AWPI Standard LP-55. Treatment of wood to be painted or to make contact with painted parts and wood to which finishing materials will be fastened shall be in accordance with AWPI Standards LP-2 or LP-4. Treatment of wood used in conjunction with built-up roofing shall be in accordance with AWPI Standard LP-2. Wood treated with oil-borne preservatives shall be clean, free from surface oil, and properly seasoned for use in building construction. Wood treated with water-borne preservatives shall be air-dried or kiln-dried to the moisture content specified for lumber and marked with the word "Dry." Treated wood which is cut shall be brush-coated with the preservative used in the original treatment.

8. **FIRE-RETARDANT TREATMENT:** To the extent indicated below, wood members and plywood as specified in this section shall be fire-retardant treated in accordance with Military Specification MIL-L-19140. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings. Each piece of treated material shall bear the identification of the testing agency to indicate performance in accordance with such rating.

9. INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

9.1 General: Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place. Where detailed nailing requirements are not specified, nail size and nail spacing shall be sufficient to develop maximum strength of the connection without splitting the members. Installation of timer connectors shall conform to applicable requirements of the National Forest Products Association publication National Design Specification for Stress-Grade Lumber and its Fastenings. Members shall be framed for the passage of ducts and pipes and shall not be cut, notched, or bored more than 1/4 of their depth without adequate and approved reinforcing. Rafters and joists shall be set with crown edge up. Framing shall be kept at least 2 inches away from chimneys and 4 inches away from fireplace backwalls. Leveling of joists, beams, and girders on masonry or concrete shall be with slate or steel and on wood or metal shall be without the use of shims.

9.2 Structural glued laminated members, fabricated wood trusses, and other fabricated structural members: Members shall be adequately braced before erection. Members shall be alined and all connections completed before removal of bracing. Individually wrapped members shall be unwrapped only after adequate protection by a roof or other cover has been provided. Scratches and abrasions of factory applied sealer shall be treated with two brush coats of the same sealer used at the factory.

9.3 Sill plates shall be set level and square and anchor bolted at not more than 6 feet on centers and not more than 12 inches from each end of each piece. A minimum of 2 anchors shall be used for each piece.

9.4 Partition and wall framing: Unless otherwise shown, studs shall be spaced 16 inches on centers. Studs shall be doubled at openings. Unless otherwise indicated, headers for openings shall be made of two pieces of stud material set on edge or solid lumber of equivalent size and corners shall be constructed on not less than three full members. End studs of partitions abutting concrete or masonry shall be anchored thereto with expansion bolts, one near each end of each stud and at intermediate intervals of not more than 4 feet. Plates of partitions resting on concrete floors shall be anchored in place with expansion bolts, one near each end of each piece and at intermediate intervals of not more than 6 feet between bolts, except anchoring into concrete may be with powder-driven threaded studs of suitable type and size and at 3 feet on center in lieu of bolts. Walls and bearing partitions shall be provided with double top plates with members lapped at least 2 feet and well spiked together. Blocking for fire-stopping shall be provided so that the maximum dimension of any concealed space is not over 8 feet. Corner bracing shall be installed when required by the type of sheathing used or when siding, other than panel siding, is applied directly to studs. Corner bracing shall be let into the exterior surfaces of the studs at an angle of approximately 45 degrees, shall extend completely over wall plates, and shall be secured at each bearing with two nails.

9.5 Floor (ceiling) framing: Except where otherwise indicated joists shall have bearings not less than 4 inches on concrete or masonry and 1-1/2 inches on wood or metal. Joists, trimmers, headers, and beams framing into carrying members at the same relative levels shall be carried of joist hangers. Joists shall be lapped and spiked together at bearings or butted end-to-end with scab ties at the joint and spiked to plates. Openings in floors shall be framed with headers and trimmers. Headers carrying more than two tail joists and trimmers supporting headers carrying more than one tail joist shall be doubled, unless otherwise indicated. Joists shall be doubled under partitions parallel with floor joists. Joists built into masonry shall be fire cut.

9.6 Roof framing with rafters: Tops of rafters shall form a true plane. Valley, ridge, and hip members shall be of depth equal to cut on rafters where practicable, but in no case less than the depth of the rafters. Valleys, hips, and ridges shall be straight and true intersections of roof planes. Necessary crickets and watersheds shall be formed. Rafters except hip and valley rafters shall be (well spiked to wall plate and to ceiling joists) (bolted by clip angles). Hip and valley rafters rafters shall be secured to wall plates by slip angles. Openings in roof shall be framed with headers and trimmers. Unless otherwise indicated, headers carrying more than two rafters and trimmers supporting headers carring more than one rafter shall be double. Hip rafters longer than the available lumber shall be butt jointed and scabbed. Valley rafters longer than the available lumber shall be double, with the pieces lapped not less than 4 feet and well spiked together.

9.7 Bridging: Wood bridging shall have ends accurately bevel cut to afford firm contact and shall be nailed at each end with two nails. Metal bridging shall be nailed as recommended by the manufacturer. The lower ends of bridging shall be driven up tight and secured after subflooring or roof sheathing has been laid and partition framing has been installed.

9.8 Blocking shall be provided as necessary for the application of siding, sheathing, subflooring, wallboard, and other materials or building items, and to provide fire stopping. Blocking shall be cut to fit between framing members and rigidly nailed thereto.

10. INSTALLATION OF INSULATION:

10.1 General: Insulation shall be installed only when construction has advanced to the point that remaining construction operations will not damage the insulation. For batt or blanket insulation and loose fill or granular fill thermal insulation, the actual installed thickness shall provide a U-value of 15 for the completed exterior wall construction and a U-value of 15 for the completed ceiling construction as determined in accordance with recognized methods in agreement with the Guide and Data Books published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers. Computations for establishing insulation thickness for the specified U-value shall be submitted for approval. Where electric outlets, ducts, pipes, vents, or other utility items occur, insulation shall be placed on the cold or weather side of the item. For batt or blanket acoustical insulation, thickness shall be as shown on the drawings. Installation, except as otherwise specified, shall be in accordance with the manufacturer's approved instructions.

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10.2 Batt or blanket insulation shall be installed between framing members; and insulation with facings shall be secured to the sides of the framing members in a manner that will provide a continuous seal and so that the entire weight of the installation will be carried by the framing members.

11. INSTALLATION OF SHEATHING:

11.1 Fiberboard sheathing shall be applied with edges 1/8 inch apart at joints, fitted snugly at abutting frames of openings, and nailed or stapled in accordance with the manufacturer's approved instructions. Sheets 2 feet wide shall be applied horizontally with tongued edge up, with vertical joints over supports, and with vertical joints staggered. Sheets 4 feet wide shall be applied vertically, extended over top and bottom plates, and with all vertical and horizontal joints over supports.

11.2 Plywood sheathing shall be applied with edges 1/8 inch apart at side joints and 1/16 inch apart at end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center. Nailing of edges shall be 3/8 inch from the edges. Wall sheathing shall extend over top and bottom plates, and if applied horizontally the vertical joints shall be made over supports and staggered. Wall sheathing over which wood shingles will be applied shall be applied horizontally. Roof sheathing shall have face grain at right angles to supports, end joints made over supports, and end joints staggered.

11.3 Wood sheathing: End joints shall be made over framing members and shall be so alternated that there will be at least two boards between joints on the same support. Each board shall bear on at least three supports. Boards shall be nailed at each support using two nails for boards 8 inches and less in width and three nails for boards more than 8 inches in width.

12. INSTALLATION OF MOISTURE BARRIER: Moisture barrier shall be applied over all wood wall sheathing, over studs to directly receive horizontal siding or board siding, over any wall sheathing to receive an unbacked stucco base, and over square edge wood subflooring to receive wood strip flooring. Moisture barrier over sheathing shall be applied horizontally, starting at the bottom, and shall be lapped 6 inches at edges and ends, and shall be nailed at laps 16 inches on center. Moisture barrier over subfloor shall be applied as the strip flooring installation progresses and shall be lapped 2 inches at edges and ends.

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FINISH CARPENTRY

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SECTION IV

FINISH CARPENTRY

1. MATERIALS shall conform to the respective specifications and other requirements specified below:

1.1 Nails: Size and type best suited for the purpose, hot dip galvanized or aluminum for exterior use, in accordance with Federal Specification FF-N-105 when applicable to the type to be used. For siding, length of nails shall be sufficient to extend 1-1/2 inch into supports, including sheathing over framing, or to penetrate full thickness of plywood or wood sheathing if nailing into supports is not specified. Screws for use where nailing is impracticable shall be of the size best suited for the purpose.

1.2 Siding: Hardboard, plywood or wood for horizontal siding; either hardboard or plywood for panel siding.

1.2.1 Wood (horizontal) (vertical) siding: Species and grade in accordance with SPECIES AND GRADE TABLE at end of this section, (horizontal bevel type, minimum 3/16 inch thin edge by minimum 7/16 inch thick edge) ((plain lap) (horizontal drop) (vertical board) (board and batten) type, 1 inch thick,)), (6) (8) (10) inches wide, maximum practicable lengths, (smooth face) (roughsawn texture face).

1.3 Trim: Species and grade in accordance with SPECIES AND GRADE TABLE at the end of this section; designs indicated for such items as handrails; patterns in accordance with grading rules for the species for such items as door and window casings, fascias, baseboards, and caps; patterns and sizes according to Commercial Standard CS208 for door frames; assembled and sanded at the mill insofar as practicable; maximum practicable lengths, finger joints permitted when finish is paint. Metal corners may be furnished in lieu of wood corner boards for horizontal siding, and if furnished shall be galvanized and primed or aluminum and primed.

2. GRADING AND MARKING: Hardboard, plywood, lumber, shingles, and trim shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which they were produced. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Except for plywood and lumber, bundle marking or certificates will be permitted in lieu of marking each individual piece.

3. SIZES AND PATTERNS: Lumber sizes and patterns shall conform to Simplified Practice Recommendation 16, and unless otherwise specified shall be surfaced on four sides. Sizes and patterns for materials other than lumber shall conform to the requirements of the rules or standards under which they are produced. Size references, unless otherwise specified, are the nominal sizes, and the actual sizes shall be within the manufacturing tolerances allowed by the standard under which the product is produced.

10. **INSTALLATION OF TRIM:** Trim shall be installed straight, plumb, level, and with closely fitted joints. Blind nailing shall be used to the extent practicable, and face nailing shall be set and stopped with a nonstaining putty to match the finish to be applied. Screws shall be used for attachment to metal, and setting and stopping of screws shall be of the same quality as required where nails are used. Joints shall be staggered, concealed, or placed in unobjectionable locations. Exterior joints shall be made water-resistant by careful fitting and the use of white-lead paste. Molded work shall be coped at returns and interior angles and mitered at external corners. Intersections of flat work shall be shouldered to ease any inherent change in plane.

11. **INSTALLATION OF WOODWORK ITEMS:** Woodwork items shall be set at the locations indicated and securely anchored to the supporting construction.

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SPECIES AND GRADE TABLE

SPECIES	Use (a)	Grading Rules (b, c) NELMA	NHPMA	WCLB	WWP	SCMA	SPIB	RIS
Cedar	S			C	C Select			
	T			C	C Select			
Cypress	S					C Select		
	T					C Select		
Douglas Fir	S			C & Better	C Select			
	T			C & Better	C Select			
White Fir	S			C	C Select			
	T			C	C Select			
Eastern Hemlock	S		C & Better					
	T		C & Better					
Western Hemlock	S			C	C			
	T			C & Better	C & Better			
Western Larch	S				C Select			
	T				C Select			
Idaho White Pine	S				Choice			
	T				Choice			
Lodgepole Pine	S				C Select			
	T				C Select			
Northern White Pine	S	C & Better	C & Better					
	T	C & Better	C & Better					
Norway Pine	S	C & Better	C & Better					
	T	C & Better	C & Better					
Ponderosa Pine	S				C Select			
	T				C Select			
Southern Pine	S						C or C & Better	
	T						C or C & Better	
Sugar Pine	S				C Select			
	T				C.Select			
Redwood	S							A
	T							A
Eastern Spruce	S	C Siding						
	T	C Select						
Englemann Spruce	S				C Select			
	T				C Select			
Sitka Spruce	S			C				
	T			C				

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NOTES:

(a) Uses: S, siding; T. exterior trim. Interior trim shall be any one of the species listed above and shall be the highest grade of the species for stain or natural finish and one grade below the highest grade of the species for paint finish.

(b) Abbreviations:

NELMA:	Northeastern Lumber Manufacturers Association
NHPMA:	Northern Hardwood and Pine Manufacturers Association
RIS:	Redwood Inspection Service
SCMA:	Southern Cypress Manufacturer's Association
SPIB:	Southern Pine Inspection Bureau
WCLB:	West Coast Lumber Inspection Bureau
WWP:	Western Wood Products Association

(c) Preservative treatment: Wood siding and exterior trim, except for all-heart material of cedar, cypress or redwood, shall be preservative treated and so marked in accordance with Commercial Standard CS262. Treated wood which is cut shall be brich-coated with the preservative used in the original treatment.

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SECTION V

ROOFING, SHINGLES

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SECTION V

ROOFING, SHINGLES

1. GENERAL REQUIREMENTS:

1.1 DELIVERY AND STORAGE OF MATERIALS: Deliver the materials to building site in manufacturer's unopened bundles and containers with the manufacturer's brand and name marked clearly thereon. Keep materials dry, covered completely and protected from the weather.

1.2 SURFACES AND CONDITIONS: Do not apply any shingle roofing on surfaces that are unsuitable and will prevent a satisfactory application. Contractor shall ensure that roof deck is smooth, clean, dry and that loose knots are removed and knotholes and cracks are properly covered with sheet metal nailed securely to the sheathing.

2. SAMPLES AND DESCRIPTIVE DATA:

2.1 Before delivery of any shingle roofing materials to building site, submit the following samples for approval:

2.1.1 Asphalt shingles: Three samples of each type.

2.1.2 Mineral-surfaced roofing, 12 inches by width of roll: Three pieces.

2.1.3 Asphalt-saturated felt, 12 inches by width of roll: Three pieces.

2.1.4 Nails and fasteners: Three of each type and size.

2.1.5 Smooth-surfaced roll roofing, 12 inches by width of roll: Three pieces.

2.1.6 Asphalt-saturated asbestos felt, 12 inches by width of roll: Three pieces.

2.1.7 Plastic bituminous cement: One quart.

3. MATERIALS:

3.1 Mineral-Surfaced Asphalt Strip Shingles: Provide square butt style shingles of uniform thickness, or thick butt type. Shingles shall be three or four tab type, 12 x 36 or 10 x 36 inches, except for hips and ridges as otherwise specified. All shingles shall be self-sealing type, with a factory applied adhesive for sealing. Shingles shall meet Underwriters Laboratories, Inc. requirements for Class C Wind-Resistant Shingles. Label of Underwriters Laboratories, Inc. will be accepted as evidence of conformity to this requirement. In lieu of this label, a test report from a nationally recognized and adequately equipped laboratory, competent to perform such services, certifying that the shingles have been tested and the tested shingles conform to the standards of the Underwriters Laboratories, Inc. may be submitted. Colors of shingles shall be as selected from the manufacturer's standard color range of white or light gray.

3.2 **Asphalt-Saturated Felt:** Shall conform to ASTM D226, 15 lb. type.

3.3 **Nails for Applying Shingles and Asphalt-Saturated Felt:** Nails for shingles shall be hot-dipped galvanized steel or aluminum with sharp points and flat heads 3/8-inch to 7/16-inch in diameter. Steel nails shall have annular threads; aluminum nails shall have screw threads; nail shanks shall be at least 0.105-inch and not more than 0.135 inch in outside diameter.

4. APPLICATION:

4.1 APPLICATION OF ASPHALT SHINGLE ROOFING: Apply an underlayment of the asphalt-saturated felt specified hereinbefore over the roof sheathing. Lay felt parallel to eaves with 2-inch head laps and 4-inch end laps. Nail felts sufficiently along edges to hold them in place until shingles are applied. Apply starter strip at eaves. Starter strips shall consist of one layer of strip shingles laid with cutouts reversed. Project strip 3/4-inch beyond eave line to form a drip. Fasten strip in place with one row of nails 1-1/2 inches above lower edge and spaced 3 inches on centers. Lay first course of shingles directly on top of starter strip, flush with drip edge. Aline strip properly, centering cutouts on starter strip tabs. Nail each shingle from the end adjoining previously applied shingle. Provide 2-inch headlap. In addition to nailing specified, press each tab firmly in place into the factory-applied sealant over its entire area.

4.2 APPLICATION OF ASPHALT SHINGLE ROOFING: Apply underlayment of two layers of asphalt saturated felt specified hereinbefore over roof sheathing. Lay felt parallel to eaves. Begin with a 19-inch wide felt starter course laid along eaves. Following with a 26-inch wide felt course laid along eaves, completely overlapping starter course and sheathing beyond. Continue the course by 19 inches, exposing 17 inches of the underlying sheet; end laps shall be 4 inches. Nail felt sufficiently to deck to hold them in place until shingles are applied. Provide cementing of the double underlayment of felt specified, beginning at eaves and extending up the roof slope far enough to reach a line parallel to eaves and located at least 24 inches from the inside face of exterior wall, measuring horizontally. Apply a continuous layer of plastic bituminous cement at the rate of at least two gallons per 100 square feet to the surface of the felt underlayment starter course before the first full course of felt is applied. Apply cement at the same rate to the 19-inch underlying portion of each succeeding course of felt included within the cemented area specified before placing the next course. Apply cement uniformly with a comb trowel so that at no point will felt touch felt. Press each overlying sheet firmly into the cemented area. Apply the starter strip at eaves. Starter strips shall consist on one layer of strip shingles laid with cutouts reversed. Project strip 3/4-inch beyond eave line to form a drip. Fasten strip in place with one row of nails 1-1/2 inches above lower edge and spaced 3 inches on centers. Lay first course of shingles directly on top of starter strip, flush with drip edge. Aline strip properly, centering cutouts on starter strip tabs. Nail each shingle from the end adjoining previously applied shingle. Provide 2-inch headlap. In addition to nailing specified, press each tab firmly in place into the factory-applied sealant over its entire area.

4.3 HIPS AND RIDGES: Form hips and ridges with 9-inch and 12-inch individual shingles. Bend shingles lengthwise down the center with equal exposure on each side of hip or ridge. Lap shingles to provide not more than 5-inch exposure from butt, and nail in unexposed area 5-1/2 inches from the butt and 1-inch vertically from the edge.

4.4 VALLEYS: Provide 12-inch minimum end laps in roll roofing and fill them with plastic bituminous cement.

4.4.1 Method: Apply regular shingles on both roofs simultaneously. Weave each course in turn over valley. When this method is followed, lay first regular shingle course along eaves of roof up to and over valley. Extend course along adjoining roof deck at least 12 inches. Carry first regular shingle course of adjoining roof over valley on top of previously applied shingle. Lay succeeding courses alternately, weaving valley shingles over each other for full length of valley.

5. WARRANTY: The contractor shall furnish a shingle manufacturer's warranty for self-sealing shingles. The warranty shall cover a period of two years from date of shingle installation. Repair and replacement of defective work shall be done without cost to the Government. The warranty shall provide that:

5.1 If within that period the self-sealing shingles tear or blow off the roof in whole or in part because of winds of any velocity less than 75 miles per hour, as determined by the nearest U.S. Weather Bureau Office, replacement of shingles, including both labor and materials, shall be the responsibility of the shingle manufacturer.

5.2 All shingle tabs found to be free of adhesion during the last 30 days of the warranty period shall be hand sealed at the responsibility of the shingle manufacturer.

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SECTION VI

WINDOWS

1. FACTORY PRIMING: Windows with surfaces to receive paint finish may be furnished with these surfaces factory primed when the materials and methods for priming have been approved. Factory-primed surfaces of windows will be exempt from the first coat application specified in Section PAINTING.

2. SAMPLES: One complete, full-sizes sample window of each type proposed for use shall be submitted for approval. Sample shall be complete with hardware, weatherstripping, and other accessories; shall be glazed; and if screens, storm sash, or combination storm-and-screen units are included in the contract, shall be fitted with such items that are to be used. After approval, samples may be installed in the work provided each sample is clearly identified and its location recorded.

3. STORAGE AND PROTECTION: Windows shall be stored in fully covered, well ventilated areas and protected from extreme changes in temperature and humidity.

4. DOUBLE-HUNG WINDOWS: Each window shall be provided with one sash fastener and two sash lifts, except one sash lift may be used when the window is fitted with a balance which effectively counterbalances the weight of the sash.

5. INSTALLATION: Windows shall be installed into properly prepared openings and shall have sills and heads level, and jambs plumb. Frames shall be securely anchored to the supporting construction. Windows which are not factory primed and factory glazed shall be installed only at such times that will permit job-priming and job-glazing immediately following window installation. Windows must be primed prior to completion of all other work which would raise the moisture content of the windows. Hardware shall be securely fastened to the windows, and each window shall be checked for proper operation and adjusted as necessary.

PROJECT CONSTRUCTION

OBJECTIVE

When you have completed this unit of instruction you will be able to cut and assemble a specified project using woodworking handtools.

ASSIGNMENT

Review unit 1, handtools, in textbook, Modern Carpentry, pages 9 through 22. Also read the general safety rules for handtools listed on page 25.

SUMMARY

The construction of a project during this unit of instruction serves two purposes; it provides practice in following drawings and specifications, and it enables you to "Get the Feel" of working with handtools.

QUESTIONS

1. Why are the dimensions on a drawing of importance?
2. What tools are used to check the accuracy of edges and angles of a project?
3. How many points per inch does a backsaw have?
4. Which plane is used to smooth the end of a board?
5. Why are dull tools hazardous to use?

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PROJECT CONSTRUCTION

OBJECTIVE

When you have completed this workbook you will be able to cut and assemble a project using woodworking handtools.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-I-10	1/student
Carpentry Handtools	1 set/4 students

PROCEDURE

Mission 1

Using the sketch you drew in day 7, and following the practices in textbook, Modern Carpentry, cut and assemble your chosen project. Be sure your project meets the following standards:

1. Pieces of the project must be cut to specified dimensions.
2. All edges and angles of the project will be checked with a try or sliding T-bevel square for accuracy.
3. All work must be sanded before assembly.
4. Joints of the project must fit tightly and not have an excessive amount of glue.
5. The completed project must be square and the dimensions must be within specifications.

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PREPARE THE MAN

SG 3ABR55230-II-1 thru 8
WB 3ABR55230-II-1-P1 thru 8-P1

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Department of Civil Engineering Training

Carpentry Specialist

3-15

CABINET CONSTRUCTION

September 1973

SHEPPARD AIR FORCE BASE

Designed For ATC Course Use

DO NOT USE ON THE JOB

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CARPENTRY SPECIALIST

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Dept of Civil Engineering Tng
Sheppard AFB, Texas

SG 3ABR55230-II-1
14 September 1973

SELECTING AND CUTTING MATERIAL FOR CABINET CONSTRUCTION

OBJECTIVE

This unit of instruction will aid you in learning to select material for a cabinet and to cut that material to specified dimensions.

INTRODUCTION

Cabinet making is perhaps the ultimate skill in carpentry. A good cabinet maker is in great demand in the Air Force, as well as in industry. It takes great skill, as well as enthusiasm, patience, and pride in workmanship to be a cabinet maker. The next 10 days will be devoted to helping you learn the skills required to become a cabinet maker.

INFORMATION

Read the following material in the textbook, Modern Woodworking.

1. Unit 2, Selecting and Roughing out Materials, pages 2-1 thru 2-15
2. Radial Arm Saw, pages 12-20 to 12-23
3. Portable Circular Saw, pages 12-24 to 12-26
4. Jointer, pages 11-1 to 11-7
5. Power Planes, pages 11-8 to 11-14

SUMMARY

The selection of material for a cabinet is the first step in the construction of the cabinet. Choose your material carefully so that the final appearance will be pleasing and that there will be a minimum amount of waste. Be sure you have marked your material correctly. If you cut on an incorrectly marked line, you have lost that material. Keep safety in mind at all times.

QUESTIONS

1. What type material should be used if your project requires widths wider than normal board width?

2. Defects such as ____________________ and ______________________ lower the strength, durability, and appearance of lumber.

3. Plywood provides a savings in time and ______________________________.

4. What type of cuts can be safely accomplished on a radial arm saw?

5. How do you determine the size of a radial arm saw?

6. When cross-cutting or making miter or bevel cuts on a radial arm saw, you should always place the stock against the ________________.

7. What are three main parts that are adjustable on the jointer?

8. How many knives are in the cutterhead on a jointer?

9. What is the shortest piece of material that can be edged on a jointer?

SELECTING AND CUTTING MATERIAL FOR CABINET CONSTRUCTION

OBJECTIVE

Upon completion of this workbook, you will be able to select, cut, and plane material for the construction of a cabinet.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-II-1 thru -10	1/student
Radial arm saw	1/4 students
Jointer	1/6 students
Surface planer	1/12 students
Carpentry handtools	1 set/4 students

MISSION 1

OBJECTIVE

Given a list of required construction material, select the material from the storage area and cut it to length, using the radial arm saw.

PROCEDURE

1. Determine the material necessary from the list and bring it in from the storage area.

2. Measure and mark the material according to specifications given by your instructor.

3. Following the procedures and safety practices contained in the textbook, Modern Woodworking, cut the material to length, using the radial arm saw.

MISSION 2

OBJECTIVE

Set up and adjust the jointer and plane one edge of the material that was cut in the previous objective. Planed edge must be square with one surface.

PROCEDURE

1. Determine which edge of the material you wish to plane.

2. Following the procedures and safety practices contained in the textbook, plane the edge of the material, using the jointer. Plane only enough to insure a smooth edge, square with one surface.

MISSION 3

OBJECTIVE

Set up and adjust the surface planer and surface plane the material that was cut and planed in the previous objectives. Thickness of planed material must be in accordance with specifications.

PROCEDURES

1. Following the procedures and safety practices contained in the textbook, set up and adjust the surface planer and plane the material.
2. Plane only enough to insure a smooth surface with thickness within specified tolerances.

CABINET FRAMEWORK, SIDES, AND TOP

OBJECTIVE

This unit of instruction will aid you in learning to cut and plane material for a cabinet framework, sides, and top.

INTRODUCTION

Furniture and cabinet making are the same thing. You may finish furniture a little different than you do a cabinet, but the construction procedures are just the same. A good cabinet maker can also make furniture. This unit of instruction will provide you with a general knowledge of furniture construction.

INFORMATION

Read the following material in the textbook, Modern Woodworking.

1. Furniture and Cabinetwork, pages 18-1 thru 18-24

2. Circular Saws, pages 12-1 thru 12-13.

SUMMARY

As an Air Force carpenter, you may be required to construct cabinets. The more practice you get, the better you will become.

The table saw is a versatile tool and extremely important to the carpenter. Used with care, it will serve well and last indefinitely.

QUESTIONS

1. Storing lumber in the area where it is to be used for a few days helps to control excessive ____________________ and ___ ________________.

2. Three types of construction used in cabinet work are ____________________________, ____________________________, and ________________________.

3. What is the purpose of a master layout?

4. What is the shortest length of material that should be fed into the planer?

5. How do you determine the size of a planer?

6. Stock should be checked for __________________ before it is fed into the planer.

7. How is the lower roller and table assembly on the planer adjusted? What is the purpose of this adjustment ?
8. How do you control stock on a table saw?
9. What should you use when ripping small pieces or strips?
10. How many types of joints can be cut on the table saw?

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CUTTING THE FRAMEWORK, SIDES, AND TOP FOR A CABINET

OBJECTIVE

This project will give you practical experience, using the table saw and jointer to make the framework, sides, and top of a cabinet.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-II-1 thru -8	1/student
Table saw	1/4 students
Jointer	1/6 students
Carpentry hand tools	1/4 students

MISSION 1

OBJECTIVE

Using the table saw, rip the material (which was cut and planed in the previous objectives) to a specified width.

PROCEDURE

1. Measure and mark the material according to specifications given by your instructor.
2. Set up the table saw and rip the material, following the procedures and safety practices contained in the textbook, Modern Woodworking.

MISSION 2

OBJECTIVE

Using the jointer, plane the ripped edge of the material to a specified width.

PROCEDURES

1. Determine the amount of material to be removed by the jointer.
2. Set up and adjust the jointer according to the amount to be removed. Plane the material following the procedures outlined in the textbook, Modern Woodworking.

MISSION 3

OBJECTIVE

Determine the material required for the sides and top of the cabinet, lay out this material and use the table saw to cut it to width. Comply with given specifications.

PROCEDURES

1. Refer to the given drawings to determine the amount of material required.
2. Lay out the dimensions on the material and cut it to proper size, using the table saw. Be sure to follow all safety practices and procedures contained in the textbook, Modern Woodworking.

JOINTS

OBJECTIVE

This unit of instruction will give you practical experience, making mortise and doweled joints.

INTRODUCTION

The criteria of a good cabinet maker is how well he can make joints. If the joints fit correctly and present a pleasing appearance, the rest of the cabinet work can be accomplished adequately.

INFORMATION

Read the following material in the textbook, Modern Woodworking.

1. Joints, pages 5-1 to 5-14

2. Drill Press, Mortiser, and Tenoner, pages 14-1 to 14-12

SUMMARY

Woodworking joints are easy to make if you practice and take into consideration several factors. Among these are strength, appearance, difficulty of fabrication, and quality of fit. Most fine furniture joints are cut and fitted by hand; however, the majority of work that you will do will involve machine cut joints.

QUESTIONS

1. What is the purpose of the chisel on the mortiser?

2. Why do you alternate strokes when drilling a mortise?

3. What do you do to check the setting on the mortiser before you cut your stock?

4. When boring a hole 1" deep, using the drill press, how do you set the machine?

5. Why do you change the speeds on a drill press?

6. To bore holes in small stock on a drill press, the stock should be clamped in a ______________.

7. What tool is used to lay out the marks for a dowel jig?

8. How much deeper should the hole be bored than the length of the dowel rod to be used?

9. What should the diameter of dowel rod be equal to when using it for a joint?

USING A MORTISER AND DRILL PRESS

OBJECTIVE

Upon completion of this workbook, you will be able to cut and fit mortise-and-tenon joints and doweled joints.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-II-1 thru -10	1/student
Mortiser	1/12 students
Drill press	1/3 students
Carpentry hand tools	1 set/4 students

PROCEDURE

MISSION 1

OBJECTIVE

Set up the mortiser and mortise material for joint openings to specified dimensions. Joints must fit snugly without excessive play.

PROCEDURES

1. Install the proper size hollow chisel and bit in the mortiser. Be sure to check for proper clearance.
2. Mark the location of the joint opening on your material, then clamp it in the mortiser.
3. Adjust the depth of cut, then cut the joint openings, following the procedures and safety practices contained in the textbook, Modern Woodworking.

MISSION 2

OBJECTIVE

Set up the drill press and drill holes for doweled joints as specified. Holes must be aligned so that the joined pieces will fit tightly.

PROCEDURES

1. Check specifications for size of dowel holes, select and install proper size bit in the drill press.

2. Mark the location of the holes on your stock and drill to the depth indicated in the specifications. Be sure to follow all procedures and safety practices pertaining to the drill press found in your textbook, Modern Woodworking.

TRIM WORK

OBJECTIVE

This unit of instruction will give you practical experience in using the bandsaw, jigsaw, saber saw, and lathe to cut and finish trim work.

INTRODUCTION

Trim work is used primarily for appearance, rather than functional purposes. It can be used to cover up minor flaws as evidence of shoddy workmanship. However, the trim work itself must be perfect. Never attempt to take shortcuts with trim work; always take your time, be patient, and do a good job.

INFORMATION

Read the following material in the textbook, Modern Woodworking.

1. Forming Irregular Shapes, Chamfers, and Bevels, pages 6-1 to 6-8
2. Band Saw, Jig Saw, and Saber Saw, pages 13-1 to 13-16.
3. Lathe, pages 15-1 to 15-19.

SUMMARY

This unit of instruction has covered trim work of various types including information on how to lay out, cut and finish work, using simple hand tools, and the use of powered equipment to accomplish this work. The important things to remember in doing this type of work are to be accurate in laying it out, make cuts as close to the layout lines as possible to avoid excessive hand work, and always to use caution when working with powered equipment.

QUESTIONS

1. Why is the top wheel of a band saw adjusted?
2. Where is the blade guide assembly located on the band saw?
3. Can the upper guide of a bandsaw be moved up and down?
4. What is the purpose of a saber saw?
5. What type cuts can be made with a saber saw?
6. What size blade is satisfactory for all purpose work with a saber saw?
7. What is another name for a jig saw?

8. What should you do prior to cutting complicated designs on a jig saw?

9. What purpose do the headstock and tailstock on the wood lathe serve?

10. The gouge chisel, when used with the wood lathe, is used for ________________.

11. At what speeds do you operate the wood lathe for rough-out work?

12. What are the names of the lathe chisels?

13. Where on the wood lathe are the spur center and the cup center located?

14. How is the tool rest adjusted for turning a cylinder on the wood lathe?

15. What is the purpose of the face plate on the lathe?

16. How is the face plate mounted to your stock?

PREPARING TRIM WORK FOR A CABINET

OBJECTIVE

This project will give you practical experience, using the band saw, jig saw, saber saw, and lathe to make trim work for a cabinet.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-II-1 thru -10	1/student
Band saw	1/6 students
Jig saw	1/12 students
Saber saw	1/2 students
Lathe	1/12 students

MISSION 1

OBJECTIVE

Using the band saw, cut the notch for the toeboard in the cabinet sides to the specified dimensions.

PROCEDURES

1. Measure and mark the cabinet sides for the notch.
2. Adjust the upper guide so that it is 1/4" above the stock to be cut.
3. Following the procedures and safety practices for the band saw outlined in the text, Modern Woodworking, cut the notch.

MISSION 2

OBJECTIVE

Cut an inside curve in cabinet material, following a given pattern, using both the jig saw and saber saw. Cut should not vary from the pattern more than 1/16".

PROCEDURES

1. Obtain the pattern from your instructor and lay out the design on your material.
2. Following the procedures outlined in the text, Modern Woodworking, for the jig saw and saber saw, cut half of the design with the jig saw and the other half with the saber saw.

MISSION 3

OBJECTIVE

Using the lathe, turn stock for the door handles and drawer pulls to specified dimensions.

PROCEDURES

1. Determine from specifications the length of stock necessary for handles and pulls.
2. Center the stock in the lathe and have your instructor check it for proper fit.
3. Following the procedures and safety practices outlined in the text, Modern Woodworking, turn the stock until it is the size specified.
4. The piece of material may be sanded smooth while still in the lathe. Care must be taken so that the turning wood does not "grab" the sandpaper and possibly vour hand.
5. Remove the material from the lathe and cut it into 2" pieces, using the band saw and a miter gauge.

CURVED EDGE SANDING

OBJECTIVE

This unit of instruction will give you practical experience, using a disc-belt sander to sand a curved edge.

INTRODUCTION

At first you may think that sanding is a simple job. Far from it, sanding requires as much skill and knowledge as any other carpentry task. In fact, correct sanding is a very important part of the finishing process.

INFORMATION

Read the following material in the textbook, Modern Woodworking: Sanding Machines, pages 17-1 to 17-5.

SUMMARY

Just as with other power equipment, sanding machines take a great amount of work out of finishing a piece of cabinet work. Care must be taken, however, not to over-sand. Power sanders remove wood quite rapidly and once it is gone, it cannot be put back.

QUESTIONS

1. What is the main use for the disk sander?
2. What is used to hold the paper on the metal disk of the disk sander?
3. Why do you move your work along the surface on the disk sander?
4. The belt sander can be positioned in two positions. What are they?
5. What do you look for on the sanding belt before installing it on the machine?
6. When sanding narrow stock on the end grain on the belt sander, what should you do?
7. You can sand flat work on a belt sander by doing what?
8. When sanding the surface of a board on the belt sander, you should do what?

SANDING CURVED EDGES

OBJECTIVE

This project will give you practical experience in sanding a curved edge with a disc-belt sander.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-II-1 thru -8	1/student
Disc-belt sander	1/6 students
Carpentry hand tools	1/4 students

MISSION 1

OBJECTIVE

Sand material to specifications, using the disc-belt sander. Sanded edges must be smooth.

PROCEDURE

1. Using the belt sander, flatten a portion of the pieces you made for your door and drawer pulls.
2. Sand the edges of the drawer sides and backs, using the disc sander.
3. Be careful to follow all procedures and safety practices outlined in the text, Modern Woodworking.

MISSION 2

OBJECTIVE

Assemble the cabinet, using the parts that were constructed in previous lessons. All joints must be tight and the corners must be square.

PROCEDURES

1. Following assembly directions contained in the cabinet drawings, assemble those parts of the cabinet that you have constructed.
2. Set up your assembly and check the joints for proper fit before applying glue.
3. Be sure that the assembly is square after tightening all clamps. If not, loosen and readjust the clamps until all joints are square and tight.

SURFACE SANDING AND DECORATIVE SHAPING

OBJECTIVE

This unit of instruction will give you practical experience in forming edges with a shaper, cutting decorative inlays with a router and sanding a surface with a portable belt sander.

INTRODUCTION

Good decorative inlays are the marks of an artist as well as a skilled craftsman. A skilled craftsman can follow a pattern. An artist makes his own pattern. In this unit of instruction, you will be following a pattern.

INFORMATION

Read the following material in the textbook, Modern Woodworking.

1. Router, Shaper and Moulder, pages 16-1 to 16-11.
2. Portable Belt Sanders, pages 17-5 to 17-7.

SUMMARY

The router and shaper are both high-speed cutting tools and require the full attention of the operator. The beginner will need lots of practice before attempting to work on a project. The portable belt sander will speed up surface sanding greatly, but must be used with caution or oversanding will occur.

QUESTIONS

1. Which type of surface is the portable belt sander designed to sand?
2. How can you prevent the belt of a portable belt sander from riding against the body of the sander?
3. What should you check for before plugging in the cord of a portable belt sander?
4. What is a sign of making too heavy of a cut when using the router?
5. What is a common cause of router bits overheating, and causing the wood to burn?
6. The device used in guiding a router in making various cuts is a ________________.
7. A cutterhead consisting of flat knives clamped between two collars is called a ____________________.
8. Where should the lock washer be placed when installing a cutterhead on a shaper?
9. What is the position of the outfeed fence on a shaper when the last edge of a piece of stock is being shaped?

SURFACE SANDING AND DECORATIVE SHAPING

OBJECTIVE

This workbook will give you practical experience in using a shaper to form edges, cutting decorative inlays with a router, and using a portable belt sander to sand wood surfaces.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-II-1 thru -8	1/student
Shaper	1/6 students
Router	1/3 students
Portable sander	1/2 students

MISSION 1

OBJECTIVE

Using the shaper, form the lipped edges on the cabinet door and drawer front material. Formed edges must be smooth and uniform.

PROCEDURES

1. Check to see that the proper cutterhead is installed on the shaper. If not, install the proper one, following the procedures outlined in the text, Modern Woodworking.
2. Use a piece of scrap material to check and adjust the cutterhead for the correct height.
3. Following the procedures and safety practices outlined in the text, Modern Woodworking, form the lipped edges on the cabinet door and drawer front material on the shaper.

MISSION 2

OBJECTIVE

Cut decorative inlays in cabinet according to specifications, using the router.

PROCEDURES

1. Lay out the pattern for the inlays on the cabinet door and drawer front material.
2. Set up and adjust the router to cut a groove 1/8" wide and approximately 1/16" deep.
3. Practice following a line on a piece of scrap material before working on your cabinet material.

4. Following the procedures and safety practices outlined in the text, *Modern Woodworking*, cut decorative inlays in the cabinet door and drawing front material, using the router.

MISSION 3

OBJECTIVE

Sand completed portions of the cabinet to prescribed standards. Sanded portions must be smooth.

PROCEDURES

1. Check the portable belt sander for the proper grit belt. If incorrect or worn, replace the belt, following procedures outlined in the text, *Modern Woodworking*.
2. Following the procedures and safety practices outlined in the text, sand the completed portions of the cabinet, using the portable belt sander.
3. CAUTION - Do not oversand! Sand only enough to produce a smooth surface. Oversanding will cause the top veneer to be removed, producing a ugly appearance.

EDGE FINISHING

OBJECTIVE

The unit of instruction will give you practical experience, using a portable vibration sander to finish sanding cabinet edges.

INTRODUCTION

Finish sanders are used for final sanding and for rubbing finishing coats. Finish sanders should be accomplished slowly and lightly. Do not overdo it.

INFORMATION

Read the following material in the textbook, Modern Woodworking : Portable Finishing Sanders, pages 17-6 to 17-8.

SUMMARY

Portable vibrator sanders are usually used for final sanding. They will produce a smooth surface with a minimum amount of effort.

QUESTIONS

1. What type sander is best for fine work?
2. Excessive pressure on the oscillating sander will cause the motor to ____________.
3. In which type of sander does the pad move in a circular path?

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CABINET ASSEMBLY AND FINISHING

OBJECTIVE

This unit of instruction will give you practical experience assembling and finishing a cabinet.

INTRODUCTION

The best part of any carpentry project is viewing the finishing product. Today you will be able to complete your cabinet and step back and view your completed work. Remember, this is your first project, it's not supposed to be perfect. You will do better as you gain experience and confidence.

INFORMATION

Read the following material in the textbook, Modern Woodworking: Furniture and Cabinet Work, pages 18-13 to 18-19.

SUMMARY

The proper installation of the hardware on your cabinet will give it a professional appearance. Care must be taken to insure that doors are straight and catches fit properly.

QUESTIONS

1. What are two classifications of doors?
2. What the are the three methods of hanging swinging doors on a cabinet?
3. Why are lip doors easier to cut and fit?
4. Where should drawer pulls be located?

SANDING EDGES

OBJECTIVE

This workbook will give you practical experience in using a portable vibrator sander to smooth and finish cabinet edges.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-II-1 thru -8	1/student
Vibrator sander	1/2 students
Carpentry hand tools	1/4 students

MISSION 1

OBJECTIVE

Smooth and finish sanding cabinet edges. Sanded surfaces must be smooth and free of scratches.

PROCEDURES

1. Select and install the proper grit sandpaper on the vibrator sander.

2. Following the procedures contained in the text, Modern Woodworking, for the vibrator sander, smooth and finish sanding cabinet edges.

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CABINET ASSEMBLY AND FINISHING

OBJECTIVE

This workbook will give you practical experience assembling and finishing a cabinet.

EQUIPMENT

	Basis of Issue
SW 3ABR55230-II-1 thru -8	1/student
Carpentry hand tools	1/4 students

MISSION 1

OBJECTIVE

Complete cabinet construction, using sanders and wood clamps. The cabinet must be square and all joints tight.

PROCEDURE

1. Finish the assembly of the cabinet as indicated in the drawings and specifications.
2. Insure that all joints are square and properly fitted before applying glue and clamps.
3. Apply glue, then clamps. Check squareness of joints and adjust clamps if necessary.

MISSION 2

OBJECTIVE

Install cabinet knobs and hinges. Use methods that conform to good carpentry practices as explained in the textbook, Modern Woodworking.

PROCEDURE

1. Install hinges on cabinet doors according to specifications.
2. Install doors on cabinet. Insure that the doors fit squarely and do not bind.
3. Attach drawer pulls and door handles according to specifications.

ATC-SHEPPARD AFB TEX. 79-1061

SW 3ABR55230-III-1 thru III-6-P1

Department of Civil Engineering Training

Carpentry Specialist

3-15

BUILDING CONSTRUCTION

28 December 1973

SHEPPARD AIR FORCE BASE

Designed For ATC Course Use

DO NOT USE ON THE JOB

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Carpentry Specialist

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This supersedes SW 3ABR55230-III-1 thru 7, 5 January 1972

Department of Civil Engineering Tng
Sheppard AFB, Texas

SG 3ABR55230-III-1
28 December 1973

FOUNDATIONS AND FORMS

OBJECTIVE

This unit of instruction will aid you in learning to identify various types of forms, foundations and footing, and to construct a form for a concrete slab.

INFORMATION

NOTE: You will be furnished a copy of the textbook, Modern Carpentry. It contains the technical information for this block of instruction. You will be given study assignments for each unit of instruction. These assignments will include the name of the subject to be studied, the pages to read, and any questions that must be answered.

Read the following material and answer the questions in the textbook, Modern Carpentry.

1. Footing and Foundations, Unit 6, pages 87 thru 109.

2. Answer questions 1 thru 16 on page 109, and 17 thru 20 on page 110.

NOTE: Use a separate sheet of paper for your answers. DO NOT WRITE IN THE TEXTBOOK.

CONSTRUCTING FORMS AND FOUNDATIONS

OBJECTIVE

Upon completion of this workbook you will be able to identify various types of footings, foundations and forms, and to construct a form for a concrete slab.

STANDARD OF PERFORMANCE

All questions must be answered and all answers must be correct.

All performance work must comply with the textbook, Modern Carpentry.

EQUIPMENT

	Basis of issue
SG 3ABR55230-III-1	1/student
WB 3ABR55230-III-1-P1	1/student
Modern Carpentry	1/student
Carpentry handtools	1/4 students
Power tools	1/4 students
Multiuse low wall form	1/12 students

PROCEDURE

Mission 1

1. Identify the types of forms illustrated in figures 1 and 2.

Figure 1 ______________________________

Figure 2 ______________________________

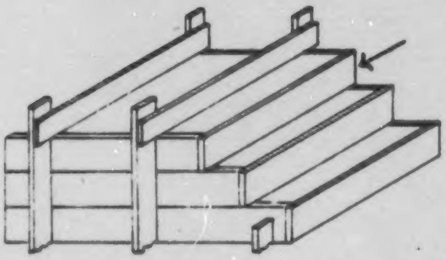

Figure 1

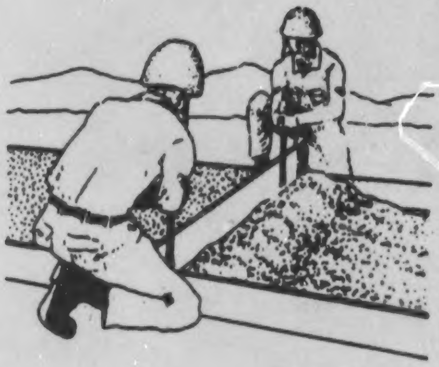

Figure 2

2. Identify the part of the step that the arrow is pointing to in figure 1. ____.

3. Identify the type of forms illustrated in figures 3 and 4.

Figure 3: ____.

Figure 4: ____.

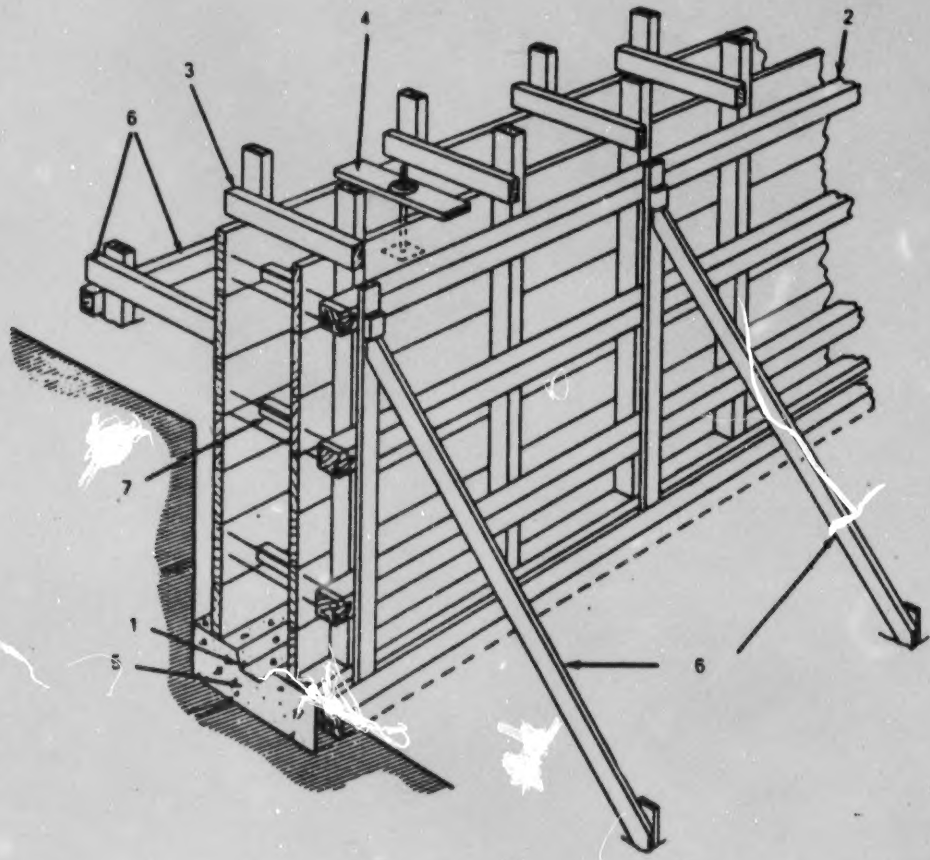

Figure 3

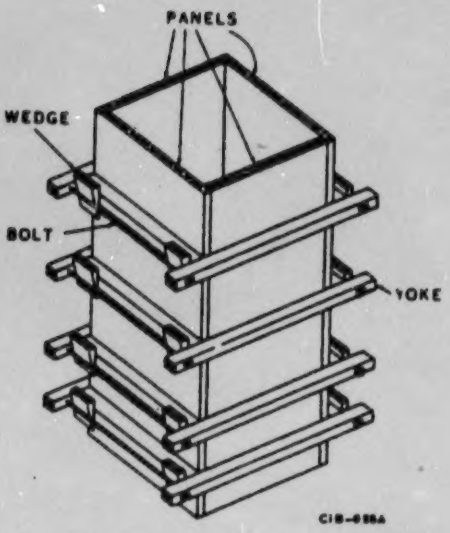

Figure 4

4. Write the name of each numbered component in figure 3 in the correct space below.

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________

Mission 2

Constructing a Form

1. Using specifications given by your instructor, measure and cut form material to the proper length.

2. Determine the location of the form and drive the first stake.

3. Check for proper alignment of the form and drive the second stake.

4. Attach the form side to the first two stakes and check again for proper alignment (straight and level).

5. Using a framing square, set the adjacent side.

6. Continue the procedures until the form is complete.

7. Check the form for squareness and make sure it is level.

LIGHT FRAME CONSTRUCTION

OBJECTIVE

Upon completion of this unit of instruction you will be able to:

- Identify the major components and construction features of a light frame structure.
- Construct a wall section containing an opening for a door or a window.

INTRODUCTION

The framework of a building is the structural skeleton that provides the support for the doors, windows, and roof. Unless the framework is the correct length, strong, straight and square, the building will be weak, unattractive, and very difficult to finish.

INSTRUCTION

Read the following information in the textbook, Modern Carpentry.

1. Floor Framing, Unit 7, pages 111 thru 133.
2. Wall and Ceiling Framing, Unit 8, pages 135 thru 155.

SUMMARY

You must "follow the rules" when framing a building. Just as the foundation must be strong, the framework of a building must be structurally sound. Proper spacing of framework members is also important for the correct mounting and fastening of finish materials.

QUESTIONS

Answer the first six questions at the end of Unit 7 on a separate sheet of paper to be turned in to your instructor on Day 22.

Answer questions 7 thru 12 at the end of Unit 7 for Day 23.

Answer the first six questions at the end of Unit 8 for Day 24.

Answer questions 7 thru 12 at the end of Unit 8 for Day 25.

518

BUILDING A LIGHT FRAME STRUCTURE

OBJECTIVE

Upon completion of this workbook you will be able to:

- Identify the major components and construction features of a light frame structure.
- Construct a wall section containing an opening for a door or a window.

STANDARD OF PERFORMANCE

All questions must be answered and all answers must be correct.

All practical work must comply with the standards in Modern Carpentry.

EQUIPMENT

	Basis of issue
SG 3ABR55230-III-2	1/student
WB 3ABR55230-III-2-P1	1/student
Modern Carpentry	1/student
Carpentry handtools	1/4 students
Power tool	1/6 students
Building mock-up	1/12 students
Framed building	1/4 students

PROCEDURE

Mission 1

Identifying the Components of a Light Frame Building

1. Fill in the following blanks with the name of each of the numbered parts in figure 5.

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
10. ____________________
11. ____________________
12. ____________________
13. ____________________
14. ____________________

525

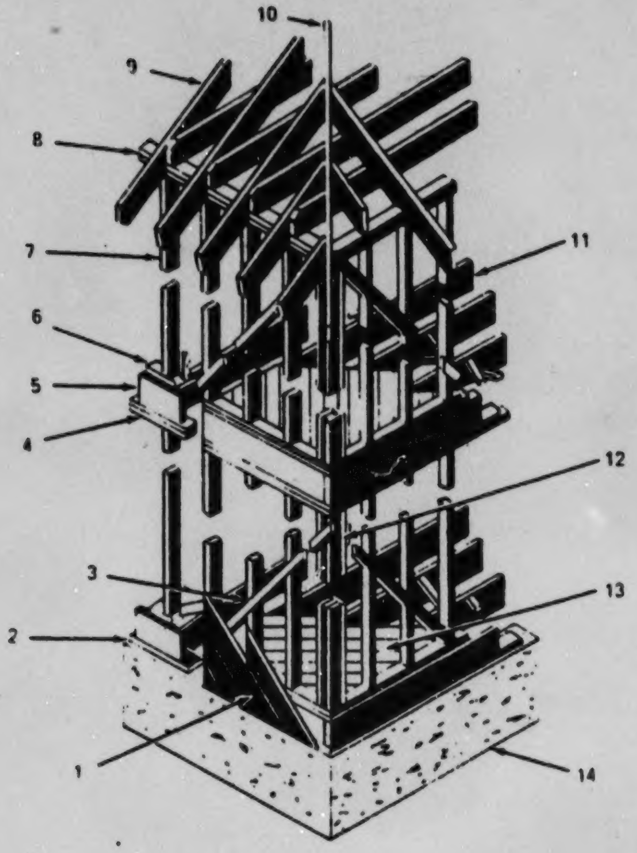
10
9
8
7
6
5
4
11
12
3
13
2
1
14
CBF-080

Figure 5

2. Fill in the blank spaces with the correct number in figure 6.

a. Double top plate ____________

b. Top plate ____________

c. Cripple stud ____________

d. Fire blocking ____________

e. Trimmer stud ____________

f. Rough sill ____________

g. Header ____________

h. Sole plate __________

i. Threshold __________

j. Cross bridging __________

k. Subfloor __________

l. Sill __________

m. Girder __________

n. Termite shield __________

o. Pier __________

p. Keyway __________

q. Wind brace __________

r. Cripple stud __________

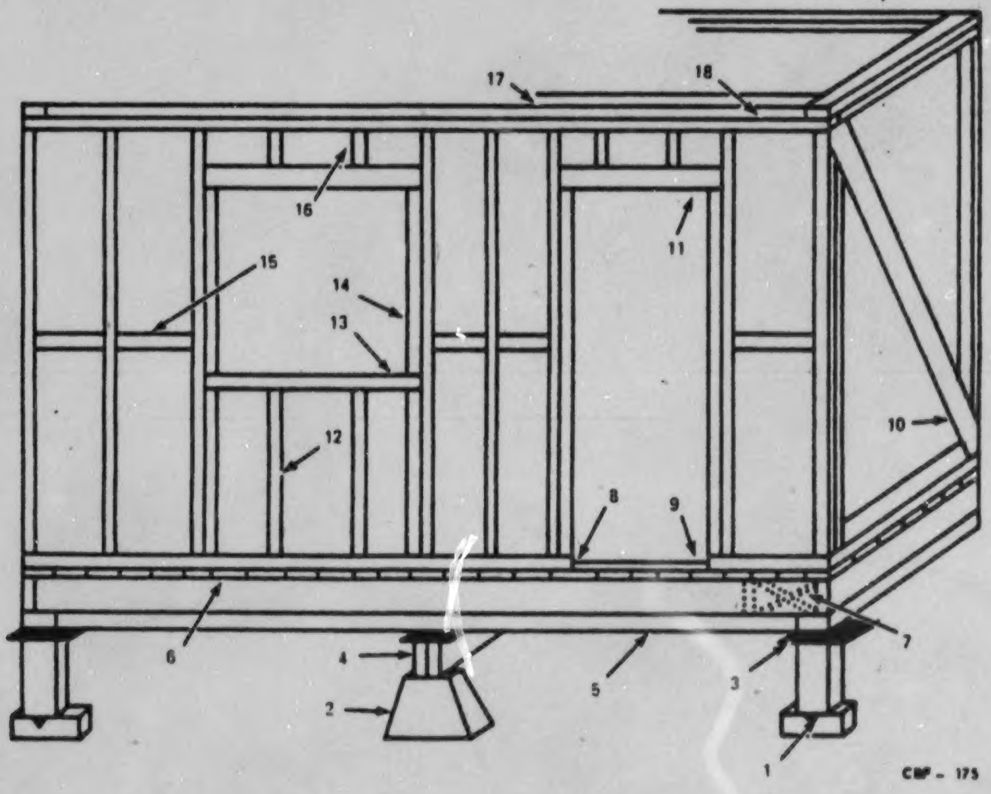
17
18
16
11
15
14
13
12
10
8
9
6
4
2
5
3
7
1
CBP - 175

Figure 6

Mission 2

Constructing a Wall Section

NOTE: The instructor will provide you with the specifications for the wall section.

1. Determine the type, amount and size of the material required.
2. Use a portable power saw and cut the material to specifications.

   CAUTION: Observe all safety precautions when using the power saw.

3. Assemble and erect the wall section.

   NOTE: Use the procedures in Unit 8 of the textbook.

SCAFFOLD CONSTRUCTION

OBJECTIVE

Upon completion of this unit of instruction you will be able to erect a single pole scaffold to a specified working height.

INFORMATION

Read the following information in the textbook, Modern Carpentry.

Scaffolds and Ladders, Unit 22, pages 445 thru 450.

SUMMARY

Although there are many commercially manufactured scaffolds available, most of the scaffolds you use will be built by you. Make sure these self-built scaffolds are strong, sturdy, and safe.

QUESTIONS

Answer questions one thru four on page 449 and questions five thru sixteen on page 450. Use a separate sheet of paper. DO NOT WRITE IN THE TEXTBOOK.

525

CONSTRUCTING A ROOF

OBJECTIVE

This workbook will give you practical experience calculating and cutting a rafter for a given application.

STANDARD OF PERFORMANCE

All calculated rafter lengths must be within 1/16 inch of specifications.

The completed roof frame must comply with the standards in Modern Carpentry.

EQUIPMENT

	Basis of issue
SG 3ABR55230-III-4	1/student
WB 3ABR55230-III-4-P1	1/student
Modern Carpentry	1/student

PROCEDURE

Mission 1

Calculating a Rafter

1. Obtain a rafter square from your instructor. Insure that it has a rafter table on it.

2. Determine the line length of a common rafter for each of the following buildings:

a. Span 12'
Pitch 1/4
Line length of common rafter________________

b. Span 10'
Pitch 1/6
Line length of common rafter________________

c. Span 12'
Pitch 3/8
Line length of common rafter________________

d. Span 10'
Pitch 1/2
Line length of common rafter________________

530

524

ROOF CONSTRUCTION

OBJECTIVE

Upon completion of this unit of instruction you will be able to calculate the length of common rafters and construct a roof frame for a wood frame building.

INFORMATION

Read the following information in the textbook, Modern Carpentry.

Roof Framing, Unit 9, pages 157 thru 183.

SUMMARY

The framing of a roof is probably one of the most difficult jobs you will find in building construction. If the various parts are not cut to the correct length and angle, the roof will be weak, unattractive and hard to construct.

QUESTIONS

Answer questions 1 through 4 on page 183 and 5 through 20 on page 184. Use a separate sheet of paper. DO NOT WRITE IN THE TEXTBOOK.

531

PORCHES AND STAIRS

OBJECTIVE

When you have completed this unit of instruction, you will be able to lay out and cut stair stringers, and construct a set of stairs for a given application.

INTRODUCTION

The purpose a porch serves is determined by the way it will be used. In some instances, only a step or two is needed to assist in movement from ground level into the doorway at an elevated position. In other cases, a platform of some size at the doorway is desirable. Protection of the doorway from rain and snow is afforded by addition of a roof, whereas further protection from wind and insects may be given by enclosures of wood, glass, or screen.

INFORMATION

Read the following information in the textbook, Modern Carpentry.

Stair Construction, Unit 16, pages 347 thru 360.

Porches

Since all porches do not rest directly on the ground, they must be supported by posts or piers. Unless they are large and two or more stories high, they do not weigh enough by themselves to require massive foundations. Pier foundations are generally sufficient to carry the load. For porches that are less than 2 or 3 feet above the ground, it is better to carry the masonry foundation work to the underside of the porch framing. This adds to the appearance and the ability to withstand shock and wear. Openings should be provided to permit air to circulate under the porch.

Floor joists and porch joists are similar in function. However, there is a need for greater weather-resistant qualities for porch joists; this is especially true for the outside joists. To provide adequate drainage, a porch floor should slope one-fourth inch per foot away from the wall of the building. Since there is no subfloor, this requires that the flooring run in the direction of the slope--or at right angles to the wall. To provide a bearing for the joists, a series of girders are run from the wall to the piers. The joists are placed at right angles to these girders and rest on top of them, or they can be cut to fit between them. Figure 7 illustrates porch joist and girder construction. Porch joists are usually spaced 16 to 24 inches apart, depending on the floor thickr and the type of wood used. You should use moisture-resistant wood, free from decay, and the wood should be treated with creosote or a standard preservative such as zinc chloride. Framing methods for porch joists are the same as for floor joists except for providing adequate drainage.

Mission 2

Constructing a Roof Frame

NOTE: The roof frame will be constructed on the building that has been partially completed in previous projects.

1. Determine the length of the common rafters.

2. Construct a roof frame for the partially completed building. The roof frame must include the ceiling joist, rafters, ridge board, collar ties, and gable end studs.

3. Follow the procedures outlined in Modern Carpentry, pages 163 thru 165 and 165 thru 166.

The roof of the porch must be supported by posts or columns. A porch post or column is a vertical member that rests on the porch floor--or in some cases upon the pier itself. The placement of the columns or posts is more a matter of good taste architecture than of any strength requirement; therefore, posts or columns are usually made much larger than actually needed to support the load of the roof. A 4- x 4-inch post or even a 2- x 4-inch post, especially if braced sideways by a porch rail, may be strong enough. However, this type of arrangement will look flimsy and is not pleasing to the eye. For this reason, porch posts or columns are often built up to give the impression of solidity.

SUMMARY

Most of your work as an Air Force carpenter relating to porches and stairs will consist of repair work. You may, however, be assigned to a job where deterioration is so bad that the only thing left to do will be to construct a new porch or set of steps.

QUESTIONS

1. What types of foundations are generally sufficient to carry the load of a porch?

2. To provide adequate drainage, how much should a porch floor slope away from the wall of a building?

3. What are the three main types of porch roofs?

4. Answer questions 1 thru 10 on page 360 of Modern Carpentry.

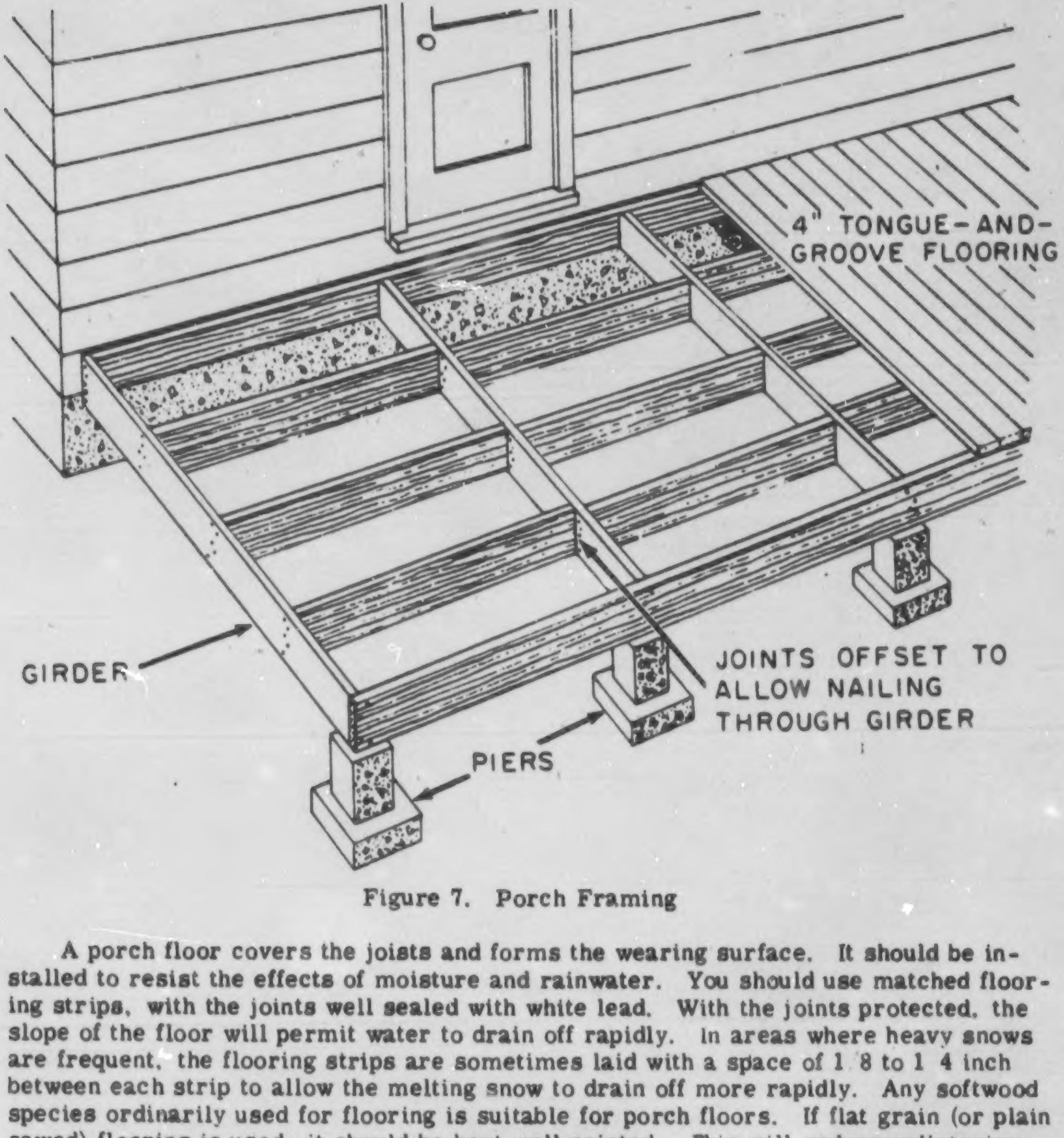
4" TONGUE-AND-GROOVE FLOORING
GIRDER
JOINTS OFFSET TO ALLOW NAILING THROUGH GIRDER
PIERS

Figure 7. Porch Framing

A porch floor covers the joists and forms the wearing surface. It should be installed to resist the effects of moisture and rainwater. You should use matched flooring strips, with the joints well sealed with white lead. With the joints protected, the slope of the floor will permit water to drain off rapidly. In areas where heavy snows are frequent, the flooring strips are sometimes laid with a space of 1/8 to 1/4 inch between each strip to allow the melting snow to drain off more rapidly. Any softwood species ordinarily used for flooring is suitable for porch floors. If flat grain (or plain sawed) flooring is used, it should be kept well painted. This will reduce splintering caused by hard wear on flat grain or plain-sawed flooring.

Generally speaking, there are three main types of porch roofs: (1) shed, (2) gable, and (3) hip. The construction features and principles for porch roof framing are the same as for the rest of the roof on the building. If a ceiling is installed, it will usually be of plywood or some type of tongue-and-groove boards.

SHEATHING

OBJECTIVE

Upon completion of this unit of instruction, you will be able to install sheathing on a roof or wall.

INTRODUCTION

Sheathing on the exterior wall serves the same purpose as subflooring does on the floor. Some types of siding are nailed directly to the sheathing rather than the studs, and depend on the sheathing for firm attachment.

The roof sheathing, like the wall sheathing and the subflooring, is a structural element and is therefore a part of the framing. Roof sheathing may be laid either horizontally or diagonally.

INFORMATION

Read the following information in the textbook, Modern Carpentry.

1. Wall Sheathing, pages 148 thru 151.
2. Roof Sheathing, pages 180 thru 182.

SUMMARY

Sheathing adds stability to a wall or roof, provides a surface to attach roofing or siding, and helps insulate a wall. Even if the sheathing cannot be seen, it should be installed correctly.

QUESTIONS

Answer question 10 on page 155 and questions 17, 18 and 19 on page 184 in Modern Carpentry.

PORCHES AND STAIRS

OBJECTIVE

Upon completion of this workbook you will be able to lay out and cut stairs stringer and construct a set of stairs.

STANDARD OF PERFORMANCE

Completed stairs must comply with the standards in Modern Carpentry.

EQUIPMENT

	Basis of issue
SG 3ABR55230-III-5	1/student
WB 3ABR55230-III-5-P1	1/student
Modern Carpentry	1/student
Carpentry handtools	1 set/4 students
Framed building	1/4 students
Portable power tools	1 set/4 students

PROCEDURE

Mission 1

BUILDING A SET OF STAIRS

1. Determine the number and size of the risers and treads for your set of stairs.

   NOTE: Use the procedures outlined in Unit 16 of Modern Carpentry.

2. Lay out the calculated dimensions on the stringer material.
3. Cut the stringers.
4. Lay out and cut the treads.
5. Assemble the parts and attach the steps to the frame building.

INSTALLING SHEATHING

OBJECTIVE

Upon completion of this workbook you will be able to install sheathing on a wall or roof.

STANDARD OF PERFORMANCE

All work must comply with the standards in Modern Carpentry.

EQUIPMENT

	Basis of issue
SG 3ABR55230-III-6	1/student
WB 3ABR55230-III-6-P1	1/student
Modern Carpentry	1/student
Carpentry handtools	1 set/4 students
Power tools	1 set/4 students

PROCEDURE

Mission 1

INSTALL SHEATHING ON A WALL

1. Estimate the amount of 3/8-inch plywood sheathing required to cover your assigned wall. Plywood required ______________________________.

2. Install the plywood sheathing vertically on the wall studs. Use 8 penny nails.

3. After the wall has been covered, cut out sections for the window and doors.

4. Trim any excesses.

5. Have the instructor check your work.

Mission 2

INSTALL SHEATHING ON A ROOF

1. Estimate the amount of 1/2-inch plywood sheathing required to cover your assigned roof.

2. Install the plywood sheets lengthwise on the rafters, starting at the eaves. Use 8 penny nails.

3. Trim excess after the roof is covered.

4. Have the instructor check your work.

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SW 3ABR55230-IV-1 thru -7

Department of Civil Engineering Training

Carpentry Specialist

BUILDING FINISH WORK

3-15

October 1973

SHEPPARD AIR FORCE BASE

Designed For ATC Course Use

DO NOT USE ON THE JOB

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CARPENTRY SPECIALIST

Block IV

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SG 3ABR55230-IV-1
10 October 1973

Department of Civil Engineering Tng
Sheppard AFB, Texas

ROOFING AND SIDING

OBJECTIVE

Upon completion of this unit of instruction, you will be able to install and replace various types of roofing and siding.

ASSIGNMENT (Day 31)

Read Unit 10, "Roofing Materials," pages 185 thru 213, in the textbook, Modern Carpentry.

SUMMARY

The roof of a building protects the structure and its contents. Different types of materials, such as wooden shingles, composition roofing, built-up roofing, metal, and mineral fiber are used for roof covering. A knowledge of the properties of these materials and the correct procedures for installation are necessary for an efficient and watertight application. Factors to be considered in selecting roofing material are: the use of the building, appearance, durability, and cost. Most roofs can be repaired by careful application of new materials after damaged sections are removed.

QUESTIONS

Answer questions 1 thru 19, page 213. Record your answers on a separate sheet of paper. Do not write in the textbook.

ASSIGNMENT (Day 32)

Read Unit 12, "Exterior Wall Finish," pages 249 thru 274 in the textbook, Modern Carpentry.

SUMMARY

Many types of siding are used, such as horizontally applied wooden siding, vertically applied wooden siding, and metal, composition, masonry, and cement-asbestos siding. All types of siding are considered finish work, and care should be exercised in their application, so that the building is attractive, as well as weathertight. Galvanized or aluminum nails are used for fastening siding.

QUESTIONS

Answer questions 1 thru 16, pages 274 and 275. Record your answers on a separate sheet of paper. Do not write in the textbook.

ROOFING AND SIDING
(Days 31 and 32)

OBJECTIVES

When you have completed the missions in this workbook, you will be able to:

1. Prepare sheathing for roofing or siding.
2. Install roofing materials.
3. Install wooden and cement-asbestos siding.
4. Install exterior trim.

EQUIPMENT

	Basis of issue
WB 3ABR55230-IV-1-P1	1/student
Clawhammer	1/student
Measuring tape	1/student
Utility knife	1/student
Nail apron	1/student
Handsaw	1/6 students
Asbestos shingle cutter	1/12 students
Combination square	1/4 students
Steel square	1/6 students
Ladder, 6' step	1/3 students

MISSION I

Objective: To prepare sheathing for roofing or siding by removing ridges, repairing holes, and applying building felt.

Using the procedures outlined in the textbook, Modern Carpentry, beginning on page 186, prepare sheathing for roofing or siding, as designated by your instructor by

1. smoothing high spots or ridges;
2. repairing holes 1 inch in diameter, or larger;
3. applying building paper so that it is straight, free of wrinkles, and fastened securely.

MISSION 2

Objective: To install roofing materials so that the courses are straight, correctly spaced, and properly fastened.

Using the procedures outlined in the textbook, Modern Carpentry, beginning on page 191, apply composition asphalt-mineral roofing to the area designated by your instructor. The following standards must be met:

1. Roofing must be straight.

2. Roofing must be properly attached.

3. Course spacing must equal that recommended by the manufacturer.

MISSION 3

Objective: To install trim on a designated surface so that openings in joints do not exceed 1/16" and trim is properly fastened using the recommended fastener.

Using the procedures outlined in the textbook, Modern Carpentry, beginning on page 249, install trim of the type designated by your instructor on a wall. The following standards must be met:

1. Openings in trim joints must not exceed 1/16 inch.

2. Trim must be fastened securely with the recommended fastener.

MISSION 4

Objective: To install siding so that courses are straight and properly spaced, material is properly fastened, and splice joints are neat.

Using the procedures outlined in the textbook, Modern Carpentry, beginning on page 256, install siding on the wall designated by your instructor. The following standards must be met:

1. Courses must be straight.

2. Courses must be correctly spaced.

3. Siding must be properly fastened.

4. Splice joints must be neat.

DOORS AND FINISH HARDWARE

OBJECTIVE

Upon completion of this unit of instruction, you will be able to install exterior and interior door frames, trim, weatherstripping, doors, and door hardware.

ASSIGNMANT (Days 33 and 34)

Read, beginning with "Exterior Door Frames," pages 238 and following to "Sliding Glass Doors," page 243, in the textbook, Modern Carpentry. Also, read Unit 17, "Doors and Interior Trim," pages 361 thru 382.

SUMMARY

Exterior doors are installed before the interior doors are, in order to get the building "in the dry." Exterior door frames consist of four pieces, with the head and side jambs made of 5/4-inch stock, and the sill made of nominal 2-inch stock. Interior door frames are made of nominal 1-inch stock, with the doorstop nailed on.

Panel doors are available in many configurations and sizes, and are acceptable for use as interior or exterior doors. Flush doors appear alike, but may be one of three types: hollow core, fiber core, and solid core.

Interior trim joints are usually one of three types: butt, miter, or coped. Interior corner joints are usually coped, while exterior joints are mitered. A scarf joint is used for making splices. Interior trim is nailed 16 inches OC, with finish nails.

QUESTIONS

Answer questions 1, 2, and 16, pages 247, and 1 thru 15, page 382. Record your answers on a separate sheet of paper. Do not write in the textbook.

DOORS AND FINISH HARDWARE
(Days 33 and 34)

OBJECTIVES

When you have completed the missions in this workbook, you will be able to:

1. Install exterior and interior door frames.
2. Measure, cut and install trim.
3. Install weatherstripping.
4. Install doors and door hardware.

EQUIPMENT

	Basis of issue
Chisel	1/student
Brace	1/2 students
Bit, expansion	1/2 students
Bit, auger, 1 inch	1/2 students
Push drill and bits	1/2 students
Mallet	1/student
Measuring tape	1/student
Combination square	1/2 students
Screwdriver, Common, 1/4 inch	1/2 students
Screwdriver, Phillips No. 1	1/2 students
Backsaw	1/2 students
Coping saw	1/2 students
Hammer	1/2 students
Utility knife	1/4 students

MISSION 1

Objective: To install a door frame and door in an existing opening.

Working as a member of a team, and using the procedures outlined in the textbook, Modern Carpentry, pages 238 thru 243, and 361 thru 364, install a door frame and door of the type designated by your instructor in an existing rough opening. The following standards must be met:

1. Head jamb level.
2. Side jambs plumb.
3. Maximum 3/16-inch clearance at sides and top of door.
4. Door must operate without binding.

MISSION 2

Objective: To measure, cut, and install trim so that openings in joints do not exceed 1/16 inch and joints are neat in appearance.

Using the procedures outlined in the textbook, Modern Carpentry, pages 379 thru 381, measure, cut, and install trim of a type designated by the instructor. Joints must be tight and neat.

MISSION 3

Objective: To install weatherstripping so that air leakage is prevented.

Using procedures shown in the textbook, Modern Carpentry, page 295, install weatherstripping of a type designated by your instructor. Installation must be neat and effective.

MISSION 4

Objective: To install door hardware, such as locks and hinges, so that the door fits properly, and hardware does not bind.

Using the procedures described by the manufacturer, or outlined in the textbook, Modern Carpentry, pages 370 thru 373, install a lock set and door hinges in a simulated door (2" x 6" stock, or wider).

VENTS, LOUVERS, AND WINDOW INSTALLATION

OBJECTIVE

Upon completion of this unit of instruction, you will be able to install vents, louvers, and windows.

ASSIGNMENT (Day 35)

1. Read the information on windows, beginning on page 215 thru page 233 in the textbook, Modern Carpentry.

2. Read the information on vents and louvers beginning on page 286 and ending on page 291.

3. Read page 465 of the textbook, Modern Carpentry.

4. Read and study the following information on glass and glazing.

Glazing

The glazing of wood or metal sashes and doors consists of two main functions: (1) sash conditioning, and (2) glass replacement. Both of these functions are explained elsewhere in this booklet. The maintenance of windows is usually very simple and often involves only the replacement of the putty. When maintaining and reglazing windows, use the same type and quality of materials used originally.

Wood sash may be glazed either at the factory or on the job. In some instances it reduces breakage and labor cost to do the glazing at the job site. However, when a large number of wood sashes are to be used, it is generally cheaper and faster to have the glazing done at the factory.

Steel sash is generally furnished open and the glazing is performed on the job.

Types of Glass

Single-strength glass is approximately 1/16-inch thick and is used for small areas never to exceed 12 square feet. Double-strength glass is approximately 1/8-inch thick and is used where high wind resistance is necessary. Window glass comes in three grades, (AA) or superior grade, (A) or very good, and (B) for general or utility grade.

Heavy sheet glass comes in various thicknesses from 3/16 inch to 1/4 inch and in sheet sizes up to 76 inches wide and 120 inches long. Sheet glass is sometimes used for windows but is usually reserved for greenhouses. It is slightly wavy and may cause a slight distortion of images viewed through it.

Plate glass is manufactured in a continuous ribbon and cut into large sheets. Plate glass is ground and polished for high quality. It comes in thicknesses from 1/8 inch to 1 1/4 inches and is usually used for large windows such as store fronts.

Tempered glass is glass that has been heated to just below its melting point and then suddenly cooled. Tempered glass cannot be cut or drilled and must be ordered to exact size. It will withstand heavy impacts and great pressures, but if tapped near the edge, will disintegrate into small pieces.

Heat strengthened glass is made by reheating polished plate or patterned glass and then rapidly cooling it.

Patterned glass is a rolled flat glass with an impressioned design on one or both sides.

Wire glass is a regular rolled flat glass with either a hexagonal twisted or a diamond-shaped welded continuous wire mesh as near as possible in the center of the sheet. The surface may be either patterned, figured, or polished.

Heat aborbing glass is usually a heavy sheet glass, 1/8-inch or 1/4-inch thick. It is either a bluish or greenish color, and it has the ability to absorb the infrared rays from the sun. More than 35 percent of the heat is excluded.

Insulating glass units are comprised of two or more sheets of glass separated by either 3/16-inch, 1/4-inch, or 1/2-inch airspace. These units are factory sealed and the captive air is dried to eliminate condensation between the glass panes. They are made of either window glass or polished plate glass. Special units may be obtained of varying combinations of heat absorbing, laminated patterned, or tempered glass.

Glare reducing glass is available in double strength, in panes up to 60 inches, 80 inches, and either 3/16-inch or 7/32-inch thick. One-fourth inch glass is available in panes up to 72 inches x 120 inches in size. It is light gray in color and it gives clear vision. Glare reducing glass is also slightly heat absorbent. One-fourth inch glass will exclude about 21 percent of the sun's heat rays.

Laminated glass is comprised of two or more sheets of glass with one or more layers of transparent vinyl plastic sandwiched between them. An adhesive applied with heat and pressure forms the layers into one unit. The elasticity of the plastic cushions any blow against the glass, preventing sharp pieces from flying. There is also laminated glare reducing glass where the pigment in the vinyl plastic provides the glare control quality.

Sash Preparation

Attach the sash to the structure so that it will withstand the design load. Adjust, plumb, and square the sash to within 1/8 inch of the nominal dimensions on the shop drawings. Seal all sash corners and fabrication intersections to make the sash watertight. Primer paint all sealing surfaces of wood or steel sash. Use appropriate solvents to remove grease, lacquers and other organic protecting finishes from the surfaces of aluminum sash.

Glass Cutting

Insofar as possible, glass should be purchased and stocked in sizes that can be used without cutting. Glass of special sizes may be cut in the shop. For glass sizes, measure all four sides of the sash and deduct 1/16 to 1/8 inch in the light size for irregularities in the sash. Minimum equipment required for glass cutting consists of a table, a common wood or metal T-square, and a glass cutter. The table should be about 4-feet square with front and left-hand edges square. Mark off the surface of the table vertically and horizontally in inches. A thin coating of turpentine or kerosene applied where the glass is to be cut is helpful in lubricating the action of the cutter wheel. A sharp cutter must be carefully drawn only ONCE along the line of the desired cut. Additional strokes of the cutter may result in breakage.

Check the dimensions of the sash openings to be sure that there is adequate clearances on all four sides of the glass. No attempt should be made to change the size of heat-strengthened, tempered or double-glazed units since any such effort will result in permanent damage. All heat absorbing glass must be clean-cut. Nipping to remove flares or to reduce oversized dimensions of heat-absorbing glass is not permitted.

Preparation before Glazing

OLD WOOD SASH. Clean all putty runs of broken glass fragments and glazier's points. Remove loose paint and putty by scraping. Wipe the surface clean with cloth saturated in mineral spirits or turpentine, prime the putty runs, and allow them to dry.

NEW WOOD SASH. Remove dust, prime the putty runs, and allow them to dry. All new wood sash shall be pressure-treated for decay protection in accordance with Federal Specification TT-W-571.

OLD METAL SASH. Remove loose paint or putty by scraping. Use steel wood or sandpaper to remove rust. Clean the surfaces thoroughly with a cloth saturated in mineral spirits or turpentine. Prime bare metal and allow it to dry thoroughly.

NEW METAL SASH. Wipe the sash thoroughly with a cloth saturated in mineral spirits or turpentine to remove dust, dirt, oil, or grease. Remove rust with steel wool or sandpaper. If the sash is not already factory-primed, prime it with rust-inhibitive paint and allow it to dry thoroughly.

Setting Glass

Do not glaze or reglaze exterior sash when the temperature is 40°F or lower unless absolutely necessary. Sash and door members must be thoroughly cleaned of dust with a brush or cloth dampened with turpentine or mineral spirits. Lay a continuous 1/16-inch thick bed of putty or compound in the putty run. The glazed face can be recognized as the side on which the glass was cut. If the glass has a bowed surface, it should be set with the concave side in. Wire glass is set with the twist vertical. Press the glass firmly into place so that the bed putty will fill all irregularities.

When glazing wood sash, insert two glazier's points per side for small lights and about 8 inches apart on all sides for large lights. When glazing metal sash, use the wire clips or metal glazing beads.

After the glass has been bedded, lay a continuous bead of putty against the perimeter of the glass-face putty run. Press the putty with a putty knife or glazing tool with sufficient pressure to insure its complete adhesion to the glass and sash. (See figure 1.) Finish with full, smooth, accurately formed bevels with clean-cut miters. Trim up the bed putty on the reverse side of the glass. When glazing or reglazing interior sash and transoms, whether fixed or movable, and interior doors, use wood or metal glazing beads. Exterior doors and hinged transoms should have glass secured in place with inside wood or metal glazing beads bedded in putty. When setting wire glass for security purposes, set wood or metal glazing beads, secured with screws, on the side facing the area to be protected. Wood sash putty should be painted as soon as it has surface-hardened. Do not wait longer than 2 months after glazing. Metal sash, Type I, elastic compound, should be painted immediately after a firm skin forms on the surface. Depending on weather conditions, the time for skinning over may be 2 to 10 days. Type II, metal sash putty can usually be painted within 2 weeks after placing. This putty should not be painted before it has hardened because early painting may retard the set.

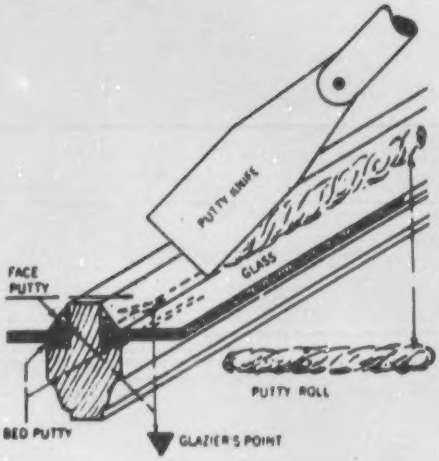


Figure 1. Setting Glass with Glazier's Paints and Putty

Clean the glass on both sides after painting. A cloth moistened with mineral spirits will remove putty stains. Ammonia, acid solutions, or water containing caustic soaps must not be used. When scrapers are used, care should be exercised to avoid breaking the paint seal at the putty edge.

Handling and cutting glass creates a serious safety hazard. Appropriate gloves and other personal protective equipment must be provided and used. Adequate procedures for the disposal of cuttings and broken glass must be established and followed.

SUMMARY

There are three general types of windows; sliding, hinged or swinging, and fixed. Window frames are made of wood, aluminum, and steel. The frame consist of two parts, the sash (or sashes) and frame. Wooden windows are held in place by nails in the exterior casing. Aluminum and steel windows have mounting flanges.

Condensation or "sweating" takes place when a surface or object is cooled below the dewpoint temperature. Vents and louvers are installed in foundations, walls, and attics to permit air circulation so that extreme temperatures and condensation are held to a minimum.

Glass is a brittle substance made of silicon and other chemicals, and is available in varying grades and thicknesses. Grade "B" glass is practical for windows. Glazing is the process of installing, securing, and puttying glass in sashes.

QUESTIONS

Answer questions 1 thru 16, page 247. Record your answers on a separate piece of paper. Do not write in the textbook.

VENTS, LOUVERS, AND WINDOW INSTALLATION

OBJECTIVES:

Upon completion of this unit of instruction, you will be able to:

1. Install vents or louvers.
2. Install a window.
3. Repair a window sash by replacing broken glass.
4. Replace screen wire on a frame.

EQUIPMENT

	Basis of Issue
Level	1/4 students
Hammer	1/4 students
Stapler	1/4 students
Putty knife	1/student
Glass cutter	1/student
Glass cutting table	1/12 students
Safety goggles	1/student
Utility knife	1/4 students

MISSION 1

Objective: To install a window frame in an existing opening.

Working as a member of a team, and using the procedures outlined on pages 225 thru 231 of the textbook, Modern Carpentry, install a window in an existing opening. The following standards must be met:

1. Head jamb and sill level.
2. Side jamb plumb.
3. Sashes must operate freely.

MISSION 2

Objective: To repair a window sash by replacing glass, and glazing.

Using the procedures outlined in SG 3ABR55230-IV-3, "Vents, Louvers, and Window Installation," cut glass for installation and glaze the window sash given you by your instructor. Observe the following safety precautions:

1. Wear eye protection when scoring or breaking glass.
2. Mark large pieces of glass with masking tape.
3. Use a "lookout" when carrying large pieces of glass.
4. Use wooden block for backing sandpaper when sanding edges of glass.

5. Dispose of glass in separate containers.

6. Do not allow glass to project beyond edges of table or workbench.

7. Use glass-breaking pliers for breaking small pieces of glass.

The following conditions must be met:

1. Glass must have 1/16-inch clearance between edges of glass and rabbet.

2. Bed putty must be approximately 1/16-inch thick.

3. Face putty must not project beyond edges of rabbet.

MISSION 3

Objective: To install screen wire on a frame.

1. Obtain a frame and screen wire from your instructor.

2. Using a stapler-tacker, staple the screen to one side of the frame approximately 1/2 inch from the inside of the frame.

3. Stretch the screen across the frame, and staple the opposite side.

4. Staple the screen to the two remaining sides of the frame.

5. Using a hawkbill knife, trim the excess screen from the frame, so that the screen does not overlap the frame more than 3/4 inch.

6. Install screen molding so that the raw edges of screen are covered. Miter the corners. Use wire brads for fastening the molding.

MISSION 4

Objective: To install a vent or louver in an opening.

1. Install a vent or louver assigned you by your instructor in an existing opening.

2. The frame of vent or louver must be square, with sides plumb.

3. Fasten in place by partially driving nails through the trim, into the framework. Leave enough of the nail sticking out so that it can be pulled easily.

NOTE: End Day 36

INSULATION, INTERIOR WALLS, FLOORING, AND PREFAB UNITS

OBJECTIVE

Upon completion of this unit of instruction, you will be able to install insulation, gypsum board, acoustical tile, paneling, flooring, floor covering, and prefabricated cabinets.

ASSIGNMENT (Day 36)

Read, beginning with 277, thru "Heat Loss Coefficients," page 279. Omit "Heat Loss Coefficients" and "How Much Insulation." Resume reading with "Types of Insulation," page 282, and read to "Acoustics and Sound Control," page 296. Answer questions 1, 2, 3, 6, 7, 8, 9, 10, and 13, page 304.

Read, beginning with "Dry Wall Construction," page 313, thru to the end of the chapter, page 329. Answer questions 1, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17, page 330.

SUMMARY

Gypsum board is an example of drywall material used as interior wall covering. Gypsum board is economical, easily handled, fireproof, and can be finished any of a number of ways, such as painting, texturing, papering, or paneling. The process of concealing the joints in gypsum board is referred to as bedding and taping.

Insulation is used to prevent heat transfer - heat loss in the winter and heat gain in the summer. Loose fill, flexible, rigid, and reflective insulation are used depending on the application and cost. Most buildings are insulated at the time of their construction - usually after the exterior walls are complete, and before completion of the interior walls.

ASSIGNMENT (Day 37)

Read Unit 15, "Finish Flooring," pages 331 thru 344, and answer questions 1 thru 10, page 345. Use a separate sheet of paper for your answers. Do not write in the textbook.

Read, beginning with "Counters and Tops," page 396, to "Cabinet Hardware," page 399.

Read "Factory Built Cabinets," pages 405 and 406.

SUMMARY

Hardwood flooring may be one of three types - strip, plank, or block. Birch, beech, maple, and oak are hardwoods used for flooring. Hardwood flooring is installed over subflooring. Blind nailing is used.

Resilient floor coverings, such as asphalt and vinyl tile and linoleum are installed with adhesive. Particle board and plywood are used for subflooring for these floor coverings.

Cabinets may be custom-built on the job, or prefabricated. All prefabricated cabinets are built on the assumption that walls are straight and floors are level. Shims are used to compensate for unlevel floors and crooked walls.

Laminated plastic is durable, pleasing in appearance, and makes excellent counter and cabinet tops. Contact Bond Cement is used to install laminated plastics.

WB 3ABR55230-IV-4-P1

INSULATION, INTERIOR WALLS, FLOORING, AND PREFAB UNITS

(Days 36 and 37)

OBJECTIVES:

When you have completed this workbook, you will be able to:

1. Install insulation.
2. Install gypsum board.
3. Install acoustical tile.
4. Install paneling.
5. Install wooden flooring.
6. Repair a wooden floor.
7. Repair asphalt floor covering.
8. Install a prefabricated cabinet or bookcase on a wall.
9. Install a section of laminated plastic.

EQUIPMENT

	Basis of Issue
Utility knife	1/3 students
Stapler	1/4 students
Hammer	1/2 students
Nail apron	1/2 students
Block plane	1/4 students
Chalkline	1/4 students
Steel square	1/4 students
Chisel	1/student
Mallet	1/student
Propane torch	1/6 students
Drill, bits	1/4 students
Laminate trimmer	1/6 students

MISSION 1

Objective: To install insulation in an existing wall, so that the insulation is smooth and that the reflective surface and vapor barriers are properly placed.

1. Using a tacker-stapler, install the flexible insulation given you by your instructor. Staple the tabs on the insulation so that the vapor barrier is toward the occupied side of the wall.

2. Staple each fastening tab to the face or side of the studs, at 8-inch intervals.

3. Make sure that the vapor barrier is smooth, with no tears that could admit insulation wetting vapors.

> CAUTION: As much as possible, avoid coming in contact with the glass fibers of the insulation. Itching and burning will result.

MISSION 2

Objective: To install gypsum board on an existing wall section so that spaces between adjoining pieces do not exceed 1/4 inch.

1. Install gypsum board on the wall or ceiling assigned you by positioning edges on studs of joists so that sufficient nailing space is provided for adjoining pieces of gypsum board.

2. Space nails 2 inches apart for ceilings; 8 inches for walls. If a nail fails to penetrate a stud rafter or plate, pull it out so that it won't work loose later.

3. Measure and lay out openings for doors, windows, and electrical boxes.

4. Use a handsaw, a sabre saw, or knife to make necessary cuts. You use a knife for long, straight cuts. You use a handsaw for partial cuts, such as cutouts for a door; you use the sabre or keyhole saw for electrical boxes, etc.

5. Spaces between adjoining pieces should not exceed 1/4 inch; however, some space between adjoining pieces is desirable so that joint compound can form a "key" in the space.

MISSION 3

Objective: To lay out and install acoustical ceiling tile so that the borders are symmetrical and the surfaces are smooth.

1. Measure and mark the center of two opposite walls of the area assigned you.

2. Join the two centerlines by snapping a chalkline.

3. Measure and mark the midpoint of the chalkline.

4. Use a steel square to lay out lines at 90° from the midpoint of the chalkline.

5. Snap a second chalkline at 90° to the first chalkline. Use the references established in step 4.

6. Begin installing ceiling tile by placing the edges of the first tile on the chalklines at the center of the room.

7. Tile will be fastened by using adhesive, staples, or nails depending on the type of tile. If adhesive is used, care must be taken so that equal amounts are used on each of the four corners of the tile, otherwise, tile and surfaces will be uneven.

8. Care must be taken also to prevent staining or smudging the finished surface of the tile.

MISSION 4

Objective: To install paneling on an existing wall so that the joints are tight and inconspicuous.

1. Your instructor will assign you an area and paneling to install on the wall assigned you.

2. Install the paneling vertically, so that the edges coincide with the center of a stud.

3. Fasten the paneling with nails provided you. Note that decorative lines are located 16 and 24 inches apart and may be used as nailing guides and as an aid in nail concealment.

MISSION 5

Objective: To install hardwood flooring.

1. Using the flooring and the panel assigned you, install the hardwood flooring on the subflooring panel.

2. Face nail the starter course, and blind nail all flooring other than the starter strip, finishing strip, or repairs.

MISSION 6

Objective: To repair damaged hardwood flooring.

1. Using the flooring panels used in Mission 5, mark one end of a piece of flooring, other than the starter or finishing strips as being damaged and in need of replacement.

2. Use a square and establish a square cutting line.

3. Cut the damaged piece of flooring from the remainder of the flooring strip. Use a sharp chisel and leave the cut on the undamaged side as square and smooth as possible. Do not cut the subfloor.

4. Remove the center section of the damaged section by splitting the section and prying out the center section.

5. Remove the two remaining side pieces. Clean the debris from the area where the repair is being made.

6. Measure and cut a replacement piece of flooring.

7. Remove the bottom lip of the groove of the replacement piece.

NOTE: Be careful when splitting with a chisel so as to not injure yourself.

8. Install the replacement piece by starting the tongue into the groove of the existing floor and then tapping the groove side of the replacement piece into place.

9. Face nail the replacement piece of flooring. Use two nails. If flooring nails are not available, use 6d finish nails.

MISSION 7

Objective: To repair asphalt floor cover by removing and replacing damaged asphalt tile.

1. Using a flame spreader on the burner of a propane torch, heat the tile to be replaced until the adhesive softens.

> NOTE: Exercise caution so that you do not scorch the tile adjacent to the tile being removed.

2. Use a putty knife to lift the damaged tile. Discard the damaged tile.

3. Install a new tile by pressing into place. The heated adhesive will be sufficient for the new tile unless it is dirty. If adhesive is dirty, scrape all old adhesive off the floor and replace with new adhesive.

MISSION 8

Objective: To install a prefabricated cabinet on a wall.

1. The cabinet assigned you by your instructor will have a mounting strip on the back. This strip should be secured to a framing member such as a stud or plate by means of screws. Screws should be long enough to penetrate the backing strip and gypsum board, and anchor firmly in a framing member. Use two screws in the top to secure the cabinet to the wall section assigned you.

2. In places where framing members are inaccessible, toggle bolts may have to be used. Secure the lower edge of the cabinet to the wall with a toggle bolt.

MISSION 9

Objective: To install laminated plastic on a surface.

1. Prepare the surface assigned you by your instructor for installation of laminated plastic by insuring that surfaces are smooth and clean.

2. Using a crosscut saw, cut a section of laminated plastic equal to the dimensions of the surface to be covered, plus about 1/4 inch on each side.

3. Apply contact bond cement to the backside of the laminated plastic and the surface to be covered.

4. Allow contact cement to dry. Use the test outlined in the textbook, Modern Carpentry, page 398, to determine readiness of the cement.

5. When cement is sufficiently dry, make application of laminated plastic, making sure that the laminated plastic is sufficiently alined so that the entire surface is covered.

6. Use a power router with a laminate cutter to trim the excess material from the edges of the laminated plastic.

PREFABRICATED BUILDING ERECTION

OBJECTIVE

Upon completion of this unit of instruction, you will be able to erect a metal prefabricated building and identify the components of the building.

ASSIGNMENT (Days 38 and 39)

Study the different manufacturer's drawings of the prefab building issued you by the instructor. Identify the different drawings and their uses.

SUMMARY

Metal buildings have some distinct advantages over wooden buildings. They have a longer lifespan due to the fact that they don't deteriorate rapidly. Construction is easy. If you can read instructions, you can assemble the building. The most important thing to remember when erecting prefabs is to follow the manufacturer's instructions.

PREFABRICATED BUILDING ERECTION

OBJECTIVES

When you have completed the missions in this workbook, you will be able to:

1. Identify the components of a metal prefab building.

2. Follow the proper erection procedure in erecting a metal prefab.

EQUIPMENT

	Basis of Issue
Hacksaw	1/6 students
Tin snips	1/6 students
Drill, electric	1/12 students
Drill bits	2/12 students
Hand Wrenches	1/6 students
Screwdrivers	1/3 students
Level	1/12 students
Chalkline	1/6 students
C-clamps	2/12 students
Square	1/12 students
Power pull	1/12 students
Ladders	2/12 students
Sawhorses	1/4 students

MISSION

Objective: To assemble a prefabricated building on an existing concrete slab, so that the building is square, the walls plumb, and the building components secure.

Using the procedures outlined in the manufacturer's instructions, erect a metal prefab building on an existing slab designated by your instructor by:

1. Making the building square.

2. Making the walls plumb.

3. Having building components secure.

HEAVY TIMBER CONSTRUCTION

OBJECTIVES

Upon completion of this unit of instruction you will be able to assemble a hoisting device; understand some of the problems involved in the maintenance of heavy timber structures, and be familiar with some of the tools and hardware used in the maintenance of heavy timber structures.

INSTRUCTION

Almost all manufactured items are eventually stored in warehouses. At these warehouses, you will find loading docks which make handling the heavy loads easier. It is important that these loading docks be maintained to prevent breakdown. It is your responsibility as an Air Force carpenter to maintain these loading docks to keep the warehouses operating efficiently.

To make this study guide easier to understand, it is divided into the following main topics:

Hoisting devices

Use of Heavy Timbers

Maintenance Problems

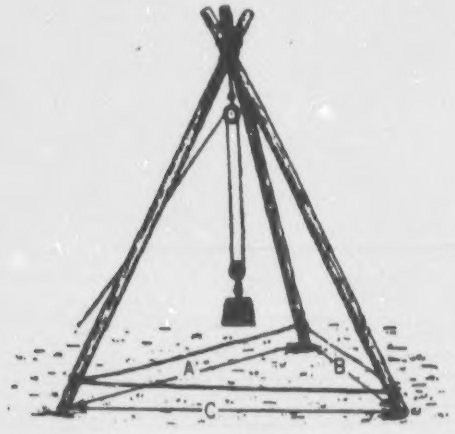
Special Tools

HOSTING DEVICES

There are many variations of a hoist and the hoist frameworks. Hoists are designed and used by personnel as a convenient and efficient method of moving heavy loads by hand. In the construction of hoists, it is important that the correct wire or rope and pulley or blocks be used to lift the load. Safety regulations prevent personnel from lifting a load which is in excess of 50 pounds for the male workers. When the load cannot be lifted safely by two or more workers, it will be necessary to employ a mechanical means of lifting the object.

One of the most simple methods of making a lifting device is to build a tripod. The tripod, as shown in figure 2, consists of three legs lashed together in the same way as a pair of shears. The tripod is stable and does not require guy wires. The disadvantage is that loads can be lifted up and down only. There are no special ways that the lashing on a tripod must be placed. It can be either wire rope or chain.

Shears are used for lifting objects and heavy machinery. They are formed by crossing the ends of two timbers, and locking them together where they cross, as shown in figure 3. Shears have many advantages, the main one being that they can be quickly assembled and erected. They possess great lateral stability. They require only two guy wires (a guy is either a wire, chain, or rope attached to anything to steady it), one at the front and one at the rear, and they can be used with the shears either standing straight up or leaning over. The legs of the shears can be either poles, structural steel or timbers, depending on the loads that the shears will be expected to lift. The rear guy wire is the most important for it will be under the most strain and therefore should be the most secure. The spread of the legs of the shears will be one-half the height, the legs should be set into the ground to make them stable and tied together to keep them from shifting.



SPREAD A, B, AND C ARE EQUIDISTANT NOT LESS THAN ONE-HALF NOR MORE THAN TWO-THIRDS HEIGHT OF CROSS

Figure 2. Tripod

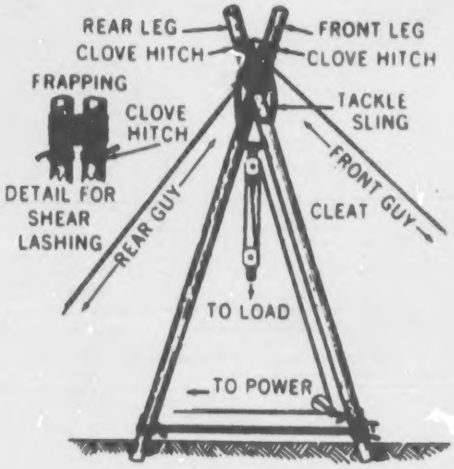


Figure 3. Shears

The gin pole, as shown in figure 4, is an excellent device for lifting loads of medium weight up to heights of 50 feet and move loads horizontally to the limit of the reach of the pole and tackle. A gin consists of an upright pole supported at the top by guy lines and equipped with tackle.

The pole can be a long, square timber or steel beam, but it should be no longer than 60 times its minimum thickness. If it is any longer, it will buckle under the load when it is hoisted. Points for anchoring the gin pole should be at least twice the distance away as the pole is long if the ground is level. They should be farther away, if the ground is not level and the ground slopes away from the pole. The gin pole is an efficient rigging support when erecting high steel towers, such as radio and transmission towers and trestle towers, when working on bridge construction.

A swinging derrick, as shown in figure 5, is a modified form of the gin pole, used for lifting medium loads. The boom is the same thickness as the gin pole and about two-thirds as long--it should never be longer than this. The derrick has two sets of tackle used in lifting the loads, one for angling the boom and the other for lifting the load. This is also one of the more efficient and easier hoisting devices to use.

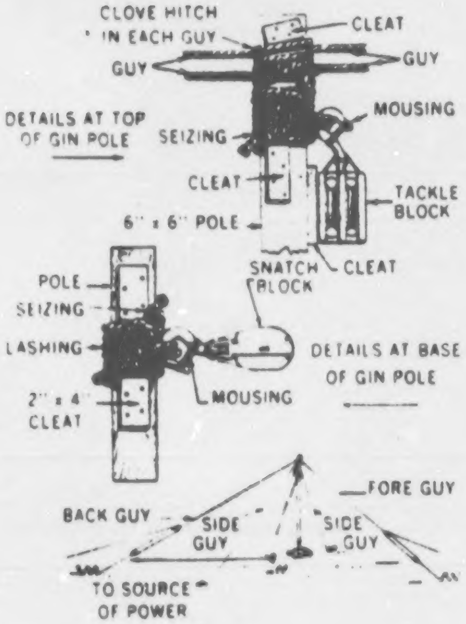

CLOVE HITCH IN EACH GUY
CLEAT
GUY
GUY
DETAILS AT TOP OF GIN POLE
SEIZING
MOUSING
CLEAT
TACKLE BLOCK
6" x 6" POLE
SNATCH BLOCK
CLEAT
POLE
SEIZING
LASHING
DETAILS AT BASE OF GIN POLE
MOUSING
2" x 4" CLEAT
FORE GUY
BACK GUY
SIDE GUY
SIDE GUY
TO SOURCE OF POWER

Figure 4. Gin Pole

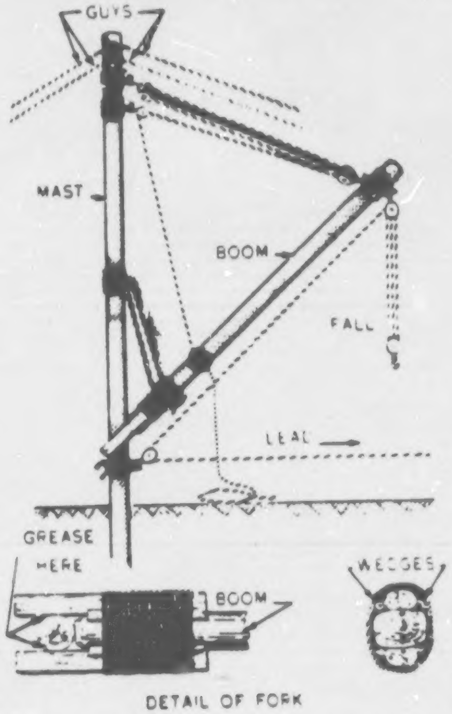

GUYS
MAST
BOOM
FALL
LEAD
GREASE HERE
BOOM
WEDGES
DETAIL OF FORK

Figure 5. Swinging Derrick

NOTE: Boom should be two-thirds the length of the gin pole.

USE OF HEAVY TIMBERS

Loading docks are used to make the loading and unloading of equipment and supplies easier. The dock must carry the weight of the cargo and the vehicles necessary to move it. Normally, the foundation of loading docks is made of concrete piers to support the columns which, in turn, support the weight of the dock. The columns are usually spaced from 6 to 10 feet apart.

Sills are fastened to the top of the columns. The sills can be solid timbers or built up of 1 inch material bolted together, so long as they are thick enough to carry the load. (See figure 6.) The joists are then placed on top of the sills. If the joists are not long enough to span the distance between sills, intermediate supports or girders are used on the inner ends. Girders are not necessary if the floor joists will safely span the distance of the sills, and the load can be carried by the floor joists. Joists are usually built of 2 inch material and they are spaced 16 to 24 inches on center.

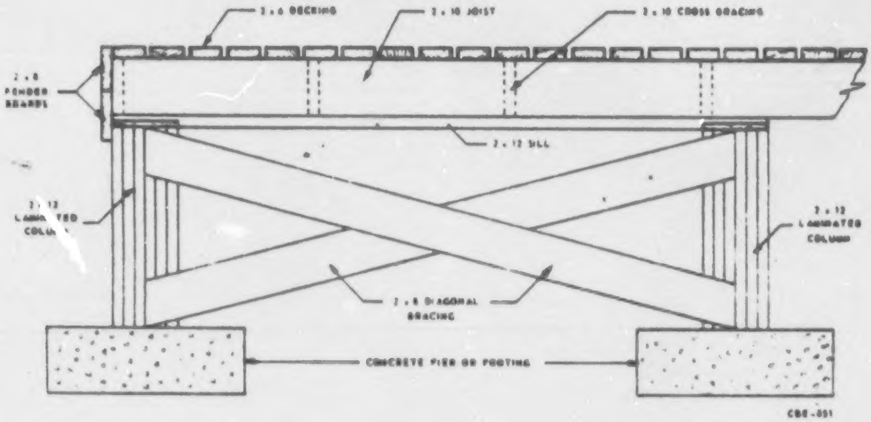


Figure 6. Side View of Loading Dock

Bracing must be installed and properly designed to give the support needed for the loading dock. Diagonal bracing should be used between columns and cross bracing used between flooring joists. The decking can now be installed on the floor joists. It is normally 2" X 8" or 2" X 10" material. It should be laid perpendicular to the joists. The joists in the decking should be staggered and all joints must be made on a floor joist.

After the dock has been erected, it is necessary to protect the structure from the impact of vehicles. For this purpose, fender boards are installed in front of the loading dock. They normally consist of 2" X 12" material. They will protect the framing members of the loading dock, thus reducing maintenance to that structure.

MAINTENANCE PROBLEMS

Fender boards will have to be removed when excessive wear occurs. Decking also becomes worn and deteriorated with excessive use. All decking must be of the same thickness to provide a smooth surface. Maximum weight signs should be posted to eliminate the possibility of exceeding the weight limit of the structure.

Inspection of the loading dock should be made at intervals to prevent major maintenance of the dock. Bolts should be tightened and fender and decking boards replaced when needed. The replacement material should be treated with a preservative to prevent rot or insect decay.

SPECIAL TOOLS

Special tools are needed to move the heavy timbers used in loading docks. They are commonly referred to as logger's tools and consist of peavys, cant hooks, pike poles, timber carriers, two-man crosscut saws, and chain saws. The cant hook is a one man carrying or rolling tool. (See figure 7.) The pike pole is a steadying or placing tool. The peavy is a combination of the two. The timber carrier is a two-man carrying tool.

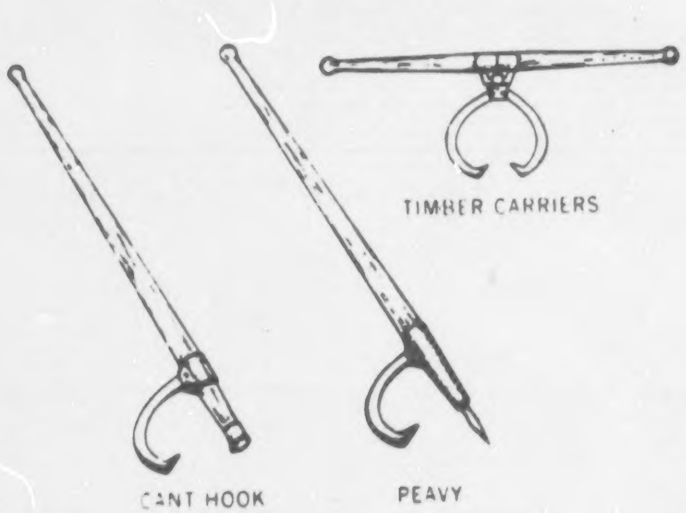


Figure 7. Timber Carriers

The two-man crosscut saw is operated by two workers. It has widely spaced teeth with every fifth tooth being a raker. The raker tooth removes the sawdust from the cut. The one man crosscut or docking saw is operated like a standard handsaw.

SUMMARY

Heavy timber construction is important to the Air Force. When doing heavy timber work, the proper tools must be used. This allows the job to be done safely and correctly.

In the construction of loading docks proper design of the structure to carry the maximum weight limit is of most importance. Handle all material for any job with care to get the maximum result, and enforce all safety regulations.

QUESTIONS

1. How far apart are the columns spaced on loading docks?
2. If joists are not long enough to span from one sill to the other, what may be used?
3. What type bracing is used between columns?
4. What type bracing is used between joints?
5. What board is installed in front of the loading dock?
6. Which two carrying tools can be used for both rolling and carrying timbers?

MAN-HOUR AND MATERIAL ESTIMATION

OBJECTIVE

Upon completion of this unit of instruction, you will be able to estimate the type and amount of materials required for a carpentry project.

INTRODUCTION

Estimating materials and labor is a vital part of effective planning and it aids in efficient use of manpower and materials. Planning for all work orders is done by the planning section of Civil Engineering. Each work center will plan work on a daily basis as a management tool in meeting schedules determined by work control.

INFORMATION

The following tables (tables 1--7) are reproductions of actual tables used for estimating labor for some of the tasks performed by the carpentry work center. Many work tasks are required of the carpentry work center--only a few are shown here.

Note that the times shown are man-hours and are recorded in whole hours, tenths, and hundredths of an hour. If two man-hours are required for a task, two men could, in most cases, do the same task in one hour.

The tables are used for estimating man-hours. Experience is required to estimate materials, and to foresee the tools and equipment required for a job.

SQUARE FEET	INSTALL	REMOVE
100	1.83	.85
150	2.75	1.27
200	3.66	1.69
250	4.58	2.11
300	5.49	2.54
400	7.32	3.38
500	9.16	4.23
600	10.99	5.07
800	14.65	6.76
1000	18 31	8.45

NOTE: Installation with adhesive does not include cove molding or furring strips. Removal includes removal of debris.

Table 1. Install or Remove Ceiling Tile

NUMBER OF DOORS	TYPE DOOR		ADDITIONAL HOURS TO CUT OPENING, FRAME, INSTALL JAMB, CASING AND TRIM
	EXTERIOR	INTERIOR	
1	3.17	2.46	4.14
2	6.35	4.93	8.28
3	9.52	7.39	12.42
4	12.69	9.85	16.56
5	15.87	12.32	20.70
6	19.04	14.78	24.83
7	22.21	17.24	28.97
8	25.38	19.70	33.11
9	28.56	22.17	37.25
10	31.73	24.63	41.39

NOTE: CT-627 and 628 are for installing door in previously framed and cased opening.

Table 2. Install Interior and Exterior Doors

SQUARE FEET	TYPE SURFACE	
	WOOD	CONCRETE
100	3.70	2.11
150	5.54	3.16
200	7.38	4.21
250	9.22	5.26
300	11.07	6.31
400	14.75	8.41
500	18.43	10.51
700	25.79	14.71
900	33.16	18.91
1000	36.84	21.01

NOTE: No time included for cleaning surface.

Table 3. Install Flooring

NO. OF OPENINGS	CUT-IN AND ROUGH FRAME	INSTALL FRAME
1	2.78	2.08
2	5.50	4.14
3	8.22	6.20
4	10.94	8.26
5	13.67	10.32
6	16.39	12.38
7	19.11	14.44
8	21.84	16.50
9	24.56	18.56
10	27.28	20.62

NOTE: CT-659 includes install sash and balances and trim.

Table 4. Install Window Framewor

LENGTH (FEET)	GYPSUM WALLBOARD			
	8'-HIGH		10'-HIGH	
	ONE SIDE	BOTH SIDES	ONE SIDE	BOTH SIDES
10	3.45	4.57	3.65	4.94
20	6.42	8.66	6.82	9.40
30	9.39	12.75	9.99	13.86
40	12.36	16.84	13.1[illegible]	18.32
50	15.33	20.93	16.33	22.78
60	18.30	25.02	19.50	27.24
70	21.27	29.11	22.67	31.70
80	24.24	33.20	25.84	36.16
90	27.21	37.29	29.01	40.62
100	30.18	41.38	32.18	55.08

Table 5. Fabricate and Install Partition

LINEAL FEET	STUD SPACING		
	16" O.C. ONE SIDE	16" O.C. BOTH SIDES	24" O.C. ONE SIDE
10	.98	1.42	.69
20	1.93	2.79	1.34
30	2.87	4.16	1.99
40	3.81	5.53	2.64
50	4.75	6.90	3.29
60	5.69	8.27	3.94
70	6.63	9.64	4.59
80	7.57	11.01	5.24
90	8.51	12.38	5.89
100	9.45	13.75	6.54

NOTE: "Material Salvaged" includes only removal of nails and laying aside or stacking.

Table 6. Remove Full Partition

LENGTH (FEET)	INSTALL	REMOVE
10	1.12	.47
20	2.24	.93
30	3.36	1.39
40	4.48	1.85
50	5.60	2.31
60	6.72	2.77
70	7.84	3.23
80	8.96	3.69
90	10.08	4.15
100	11.20	4.61

NOTE: Remove wallboard includes removal of nails and stacking for reuse.

Table 7. Install and Remove Wallboard

SUMMARY

As a carpentry specialist, you will be required to make estimations on a day-to-day basis so that you have sufficient materials, tools, and equipment for a productive day's work, without excessive lag time. Lag time is time spent waiting for material, equipment, or transportation at the job site.

MAN-HOUR AND MATERIAL ESTIMATION

OBJECTIVES

When you have completed the missions in this workbook, you will be able to:

1. Estimate man-hours.
2. Estimate materials.

MISSION 1

1. How many man-hours are required for removal and installation of 12" X 12" ceiling tile in a room that is 15' X 20'? (Refer to tables in study guide.)

2. How many man-hours are required to install one 2'6" X 6' X 8" interior door, lock, and closer in an existing opening? (Refer to tables in study guide.)

3. How much time is required to construct a partition 8 feet high, 20 feet long, studs 16 inches OC, without fire blocking, with gypsum board on both sides? (Refer to tables in study guide.)

MISSION 2

1. How many board feet of lumber are required if single plates are used, and a single stud is used at each end of the partition as described in Mission 1, question No. 3?

2. How many sheets of 4' X 8' gypsum board are required to cover both sides of the 20" X 8" partition?